MOTOR AGE

Vol. XXIX
No. 21

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In This Issue—"Racing Cars of 1916"

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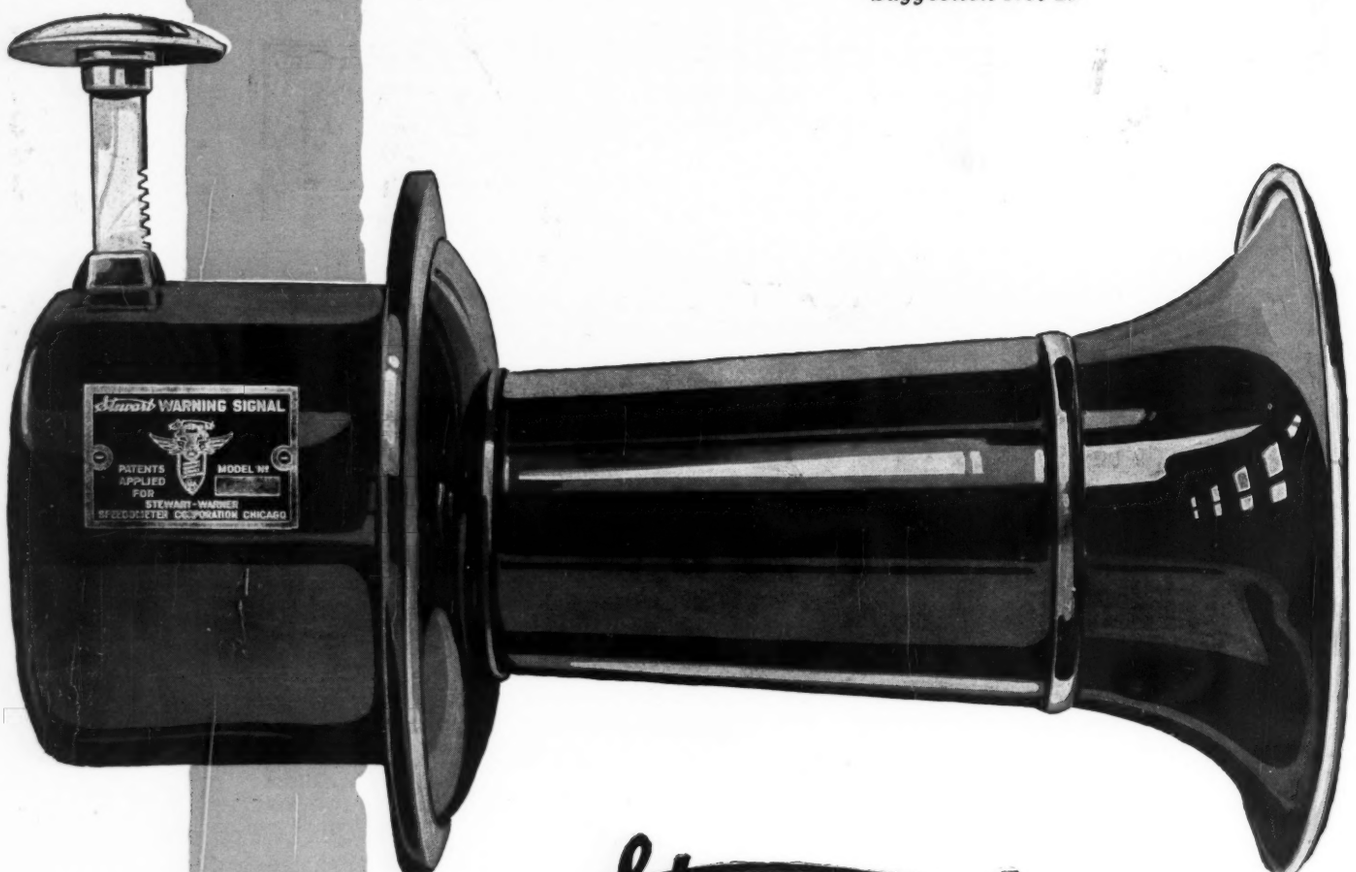

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MOTOR AGE

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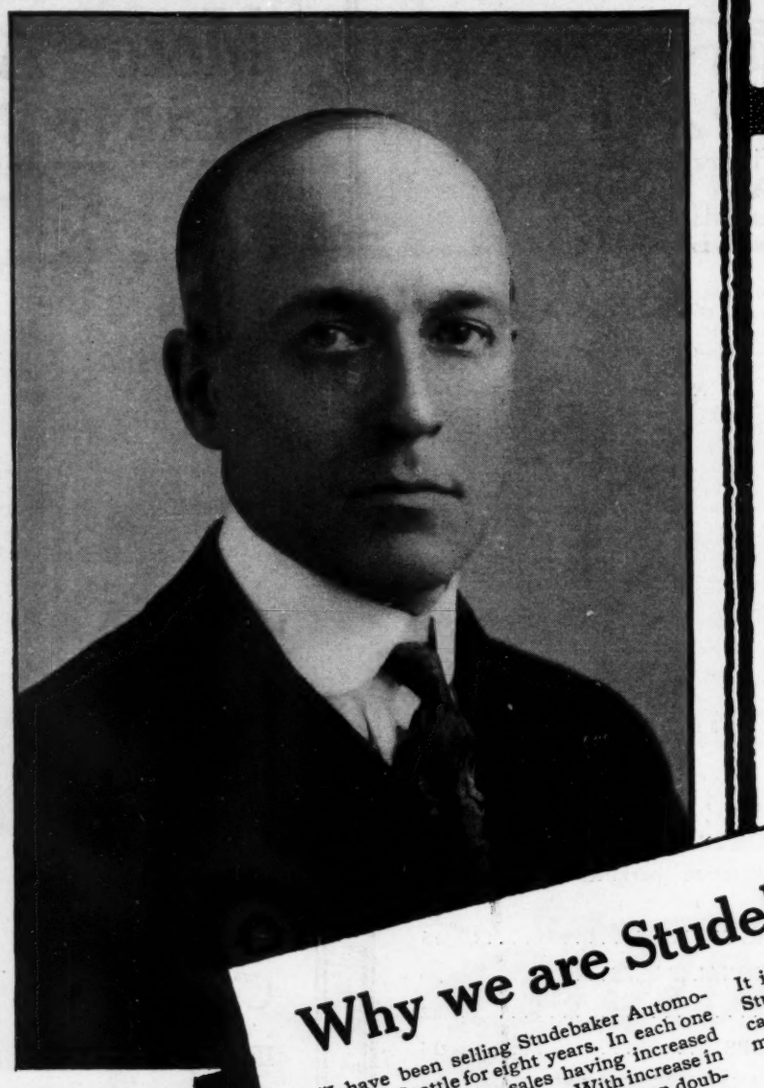
Volume XXIX May 25, 1916 No. 21

Contents

ANNOUNCEMENTS

A full report of the Sixth International Sweepstakes race at Indianapolis on Memorial Day will be the feature of Motor Age, issue of June 1. In it will be told in story and picture the thrills of the speed classic on the brick oval.



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Vol. XXIX, No. 21 Chicago, May 25, 1916 $3.00 Per Year

MOTOR AGE

Racing Cars of 1916

Details of the Season's Speed Producers—New Designs and Recent Improvements Outlined

By Darwin S. Hatch

EACH year when a car manufacturer who has been an ardent supporter of racing climbs to the top of Mercury's ladder through the staunchness of his speed creations and the skill of his drivers and the generalship of his team manager, and then announces his final retirement from competition, the pessimistic ones are loud in their wails that the knell of the speedways has been rung. Each year, likewise, finds well-filled entry lists for all of the major events and a good field lined up on every track, impatiently waiting the starting bomb.

This season has found the dark forebodings of those prophets of calamity to be unfounded. The series of races on the Pacific coast early in the season drew good fields of starters. The opening of Sheepshead Bay track was well supplied with a numerous and classy field for its three events. Chicago has announced half of its alloted number and is known to have other entries up its wooden sleeve. The other speedways—Tacoma, Seattle, Twin-Cities, Sioux City, Providence, Omaha and Des Moines—seem to be sure of sizable lists of contenders.

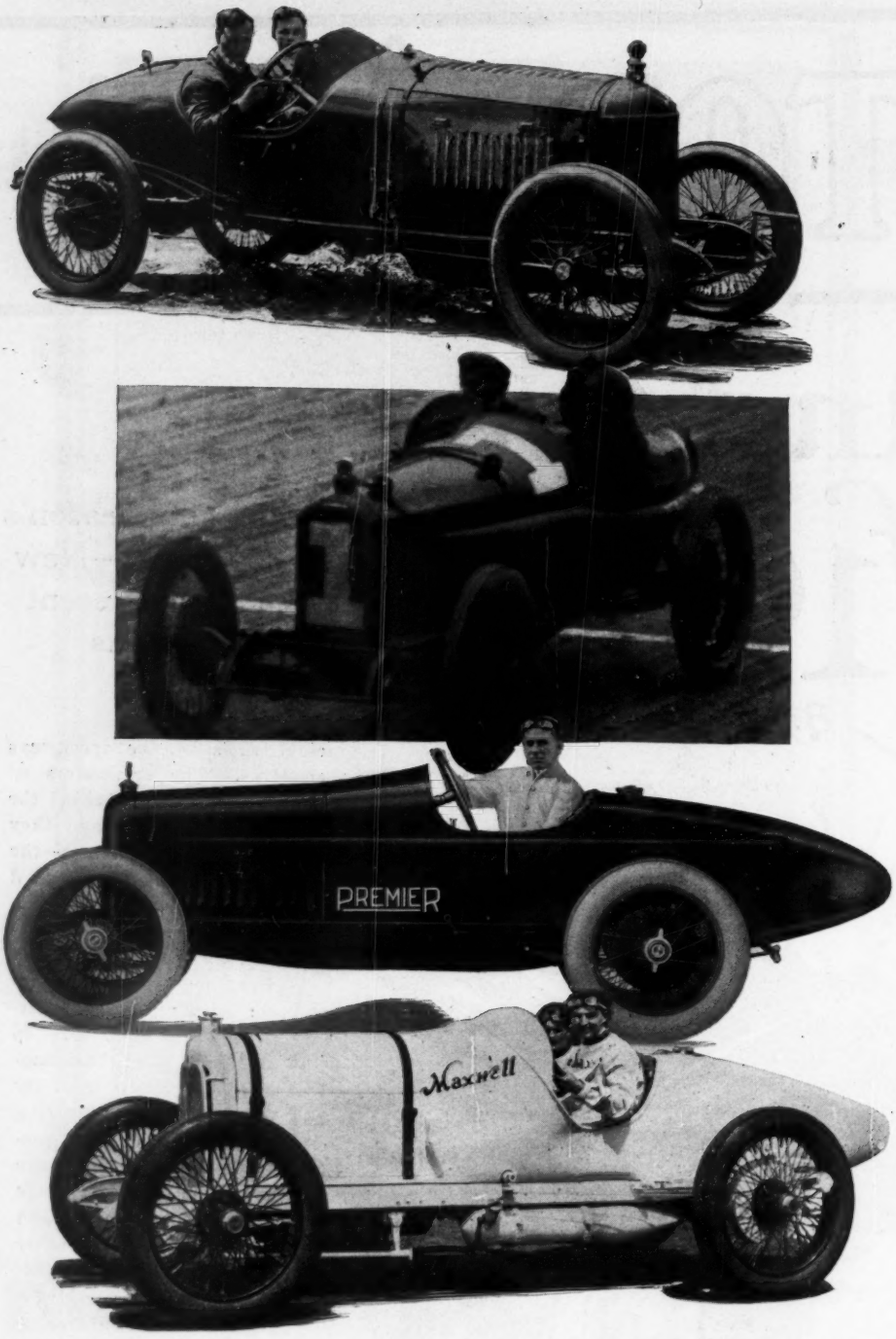
Indianapolis, whose entries for the Memorial day event closed 3 weeks ago, has thirty entries, and since the first of May no less than seven applications for post entries have been refused by the management of the Hoosier track. One of these was no less a personage than Ralph de Palma, winner of the last international sweepstakes.

True enough, there is a smaller percentage than ever of American speed cars in the Indianapolis race and a number of foreign cars have been imported. The two Sunbeams under the management of Christaens have recently come over for the season, and the grand prix Delages were imported by Harry Harkness, the New York sportsman.

The dearth of racing cars for the coming season, which threatened last winter, may have had much to do with a new phase of speedway racing, which, for sake of a better name, might be called inter-speedway racing. This is the backing of racing teams by the speedways themselves. The originators of this idea are the men behind the Indianapolis speedway and they have two teams—the Prest-O-Lite team and the Indianapolis speedway team.

They believe the day has come when the public wants to see inter-speedway races, and to this end these Indianapolis men have built or bought the fastest racing cars that they can procure. Already they have two Peugeot cars, three Premier Specials, and four Maxwells. If other speedways follow this example, it does not strain one's imagination to contemplate a world series race between the two leading teams at the end of a racing season, similar to baseball championship series. A by-product, as it were, of what the Indianapolis race men are doing is an inestimable help to all motor car engineers. For example: Recently the Indiana section of the Society of Automobile Engineers, with many visitors, were given the privilege by the speedway to take one of their foreign-built cars to pieces. This meeting was like a gathering of surgeons, who bisected and analyzed.

Everyone present was grateful to the speedway for the opportunity offered. These cars will participate in most of the speedway races the coming season, being put at the service of various indi-



Reading from top to bottom the cars and drivers are: Lecain, Delage; Resta, Peugeot; Rooney, Premier; Henderson, Maxwell

vidual drivers, who will compete with one another in the hopes of gaining the glory and the monetary rewards that accrue to the individual The Chicago speedway is following suit, and later in the year there will be a team of Ben Hur cars in competition, which, though they probably will not be speedway entries, are backed by a number of people intimately connected with the Windy City oval.

There will be a team of Mercers for later events in the season but Engineer Delling is not quite satisfied with the performance of the new cars as yet and refuses to enter them until he is sure that they come up to his requirements of performance.

It is to be expected that when they do make their appearance, the Mercers will be in shape to make a most creditable showing.

In addition, there are a number of racing cars of special design being developed all over the country, but which are the very darkest of dark horses. Their builders and sponsors are very seclusive about them.

So far as the improvements in the various speedways themselves are concerned, little has been found necessary in reconstruction or resurfacing of the plants in the major cities. Indianapolis, Chicago and New York have stood pat, not finding any extensive work on the tracks to be required after a winter's weathering. Twin City Track, it is understood, is being resurfaced and the top coat ground down to make it smoother and easier on tires.

The Cars in Detail

PROBABLY the mose interesting feature now at the Indianapolis track is taking place at the other end of town in the factory of the Mais Truck Co. Here the new Premiers are being constructed and the Peugeots of Aitken and Merz being overhauled and fitted with new parts.

The two Peugeots as a matter of fact are being fitted with Premier parts wherever they have been judged to be lacking

DRIVERS AND MOTOR SIZES OF 1916 RACERS

Sunbeam, Christaens, 4 cyl.
81.5x156 m.m., 294 cu. in.

Maxwell, Rickenbacher, 4 cyl.
3¾x6¾ in., 298.2 cu. in.

Maxwell Henderson

Frontenac, L. Chevrolet, 4 cyl.

Frontenac, A. Chevrolet.

Frontenac, G. Chevrolet.
3.87x6.375 in.

Duesenberg, O'Donnell, 4 cyl.

Duesenberg, D'Alene.

Duesenberg, Milton.

Duesenberg, Devlin.
3¾x6¾ in., 298.2 cu. in.

Ostweg Special, Ostweg, 4 cyl.
4 11/32x5 in., 296.4 cu. in.

Peugeot, Mulford, 4 cyl.

Peugeot, Merz.

Aitkin, Peugeot.
3.6x6.6 in., 274 cu. in.

Delage, Oldfield, 4 cyl.
94x160 m.m., 274 cu. in.

DuChesneau, DuChesneau, 4 cyl.
3.26x5.50 in., 184 cu. in.

Premier, Rooney, 4 cyl.

Premier, Anderson.

Premier, Stillman.
3.66x6.625 in.

Peugeot, Resta, 4 cyl.
3.6x6.6 in., 274 cu. in.

Delage, De Vigne, 4 cyl.

Delage, Lecain.
94x160 m.m., 274 cu. in.

Erwin, G. Bergdoll, 4 cyl.

Erwin, Stecher.
4x1 15/16 in., 298 cu. in.

Crawford, Chandler, 4 cyl.

Crawford, Davis.
3¾x6¾ in., 298.8 cu. in.

Pu-sun, Franchi, 4 cyl.
94x160 m.m., 274 cu. in.

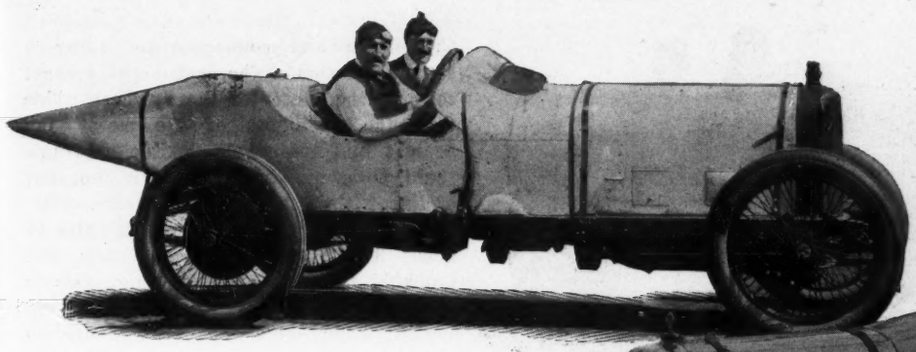
Ogren, Alley, 4 cyl.
3¾x6¾ in., 298.2 cu. in.

Hudson, Vail, 6 cyl.
3½x5, 288 cu. in.

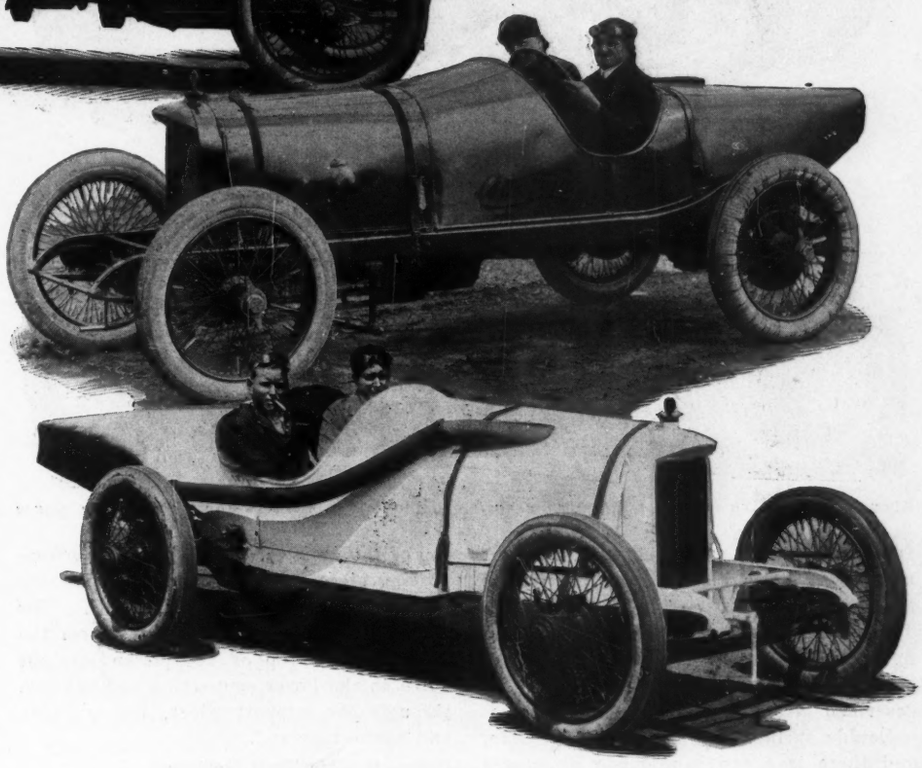
Mercedes, de Palma, 4 cyl.
3.66x6.47 in., 272.1 cu. in.

J. J. R., Watson, 4 cyl.
3 63/64x6, 299 cu. in.

Adams Special, Adams, 4 cyl.
3¾x6¾, 298.2 cu. in.



Left—Christaens and the English Sunbeam. Center—Crawford equipped with Duesenberg motor. Below—Duesenberg with its characteristicly low body.



in strength. The connecting rods, which have proven weak, have been renewed and the oiling system completely overhauled. These are the main essentials, but besides these there have been a great many other refinements.

The new Premier cars, of which there are two, have been built especially for this race. They have never yet been run even on the road and will not be on the track for 5 or 6 days. The first week in February there was not even a drawing of the new cars in existence, and considering the time and the extraordinarily hard task of getting materials of a special nature through any of the war-order-crowded plants, an extraordinary amount of progress has been made. The three cars which will be driven by Anderson and Rooney of Stutz fame, and Stillman, are about a day apart in construction, Anderson's car being in the lead in this respect.

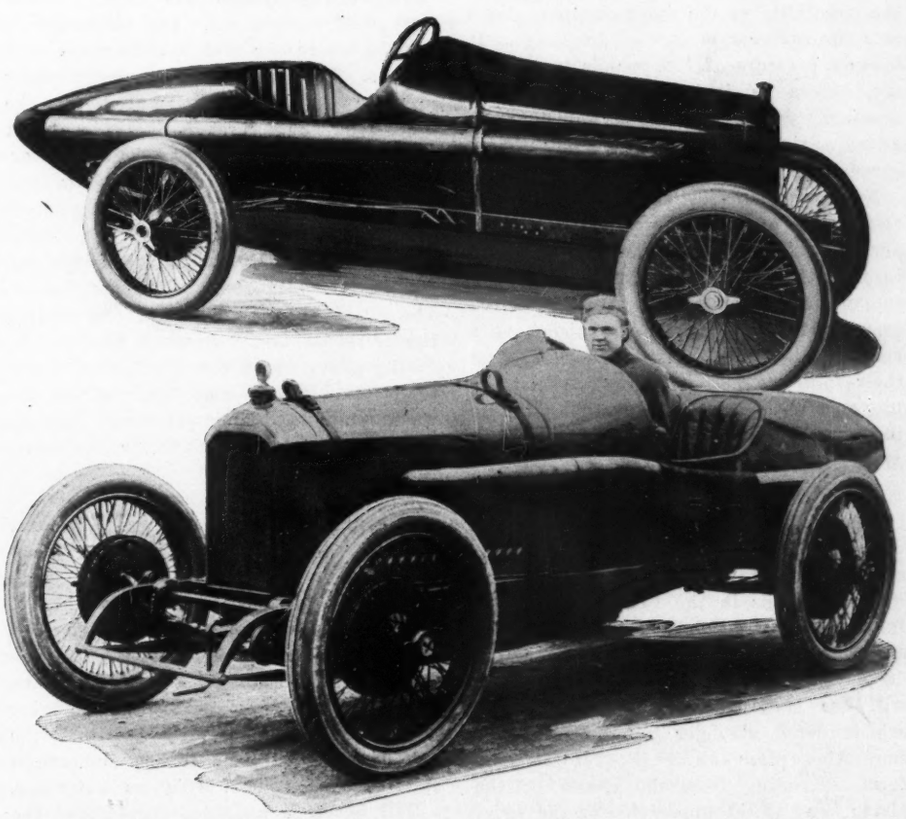
The Premier racing cars have been designed by James L. Yarian, who has the title of engineer of the racing car department of the Premier Motor Corp. In 3½ months the drawings have been worked out. The steel, which has all been ordered to special analysis, has been secured, the connecting rods, crankshafts and various parts cut from solid billets of steel and even the frames hand made, because the rolled sections could not be secured in the stock desired.

Premier Racers

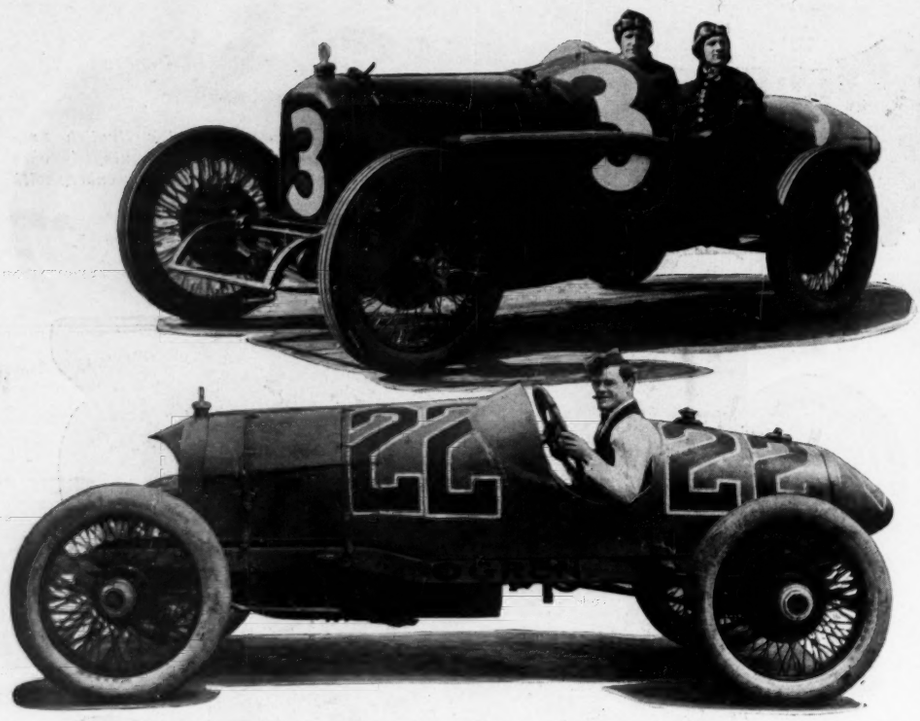
The design is a composite one, smacking somewhat of Peugeot, a little of Delage and also with a suggestion of the Mercedes. The four cylinders are block cast and have a bore of 3.660 and a stroke of 6.625. The cylinder casting is probably one of the most complex ever made, as the water jacket is only a sheet of metal $\frac{1}{8}$ inch thick and does not touch the cylinders at any points except the top and bottom throughout the entire length of the casting.

Sixteen valves are used and these are placed overhead, being driven by two overhead camshafts contained in separate aluminum housings. The intake valves are $1\frac{15}{16}$ and the exhaust $1\frac{9}{16}$ and each have a lift of $\frac{3}{8}$ inch. The valves are, like most of the other working parts through the car, of special steel, analysis and heat treating specifications being the results of experiments by the designer.

The timing gears are pinned to the



Above—One of the Frontenacs, three of which are to be driven by the Chevrolet brothers. Below—Charlie Merz in the Peugeot he will drive at Indianapolis



Above—John Aitken in one of the new Peugeots. Below—Tom Alley at the wheel of the Ogren

front end of the camshaft with different number of holes in the gear and flange, thus giving a vernier style of adjustment. The camshaft is hollow and is carried on five bearings. The hollow through the camshaft acts as an oil lead as will be described later.

Double springs are used on each valve, and there is a provision made by means of an enlarged section to guard against the possibility of the valve dropping down into the cylinder in case of breakage. It takes a pressure of 150 pounds to operate the valves ⅜ inch against the spring pressure, which should be sufficient to guard against riding, even at the highest speeds.

No clearance adjustment is provided for at the ends of the valve stems. The manner in which the adjustment is made is through the means of buttons. The valve tappets are hollow and in the ends of the tappets are inserted buttons which have a neck of sufficient length to guard against their falling out. The button nearest the proper size is selected and then filed to the correct clearance.

Strengthen Connecting Rods

Although the reciprocating weights of the new motors are 2 pounds lighter than those of the Peugeots, the connecting rods are stronger at the upper ends, the point where the rods in the Peugeot cars have failed. This result has been accomplished by using a different shaped flange and a deeper web, although the basic I-beam still has been maintained. The pistons are rendered stronger by the use of a supporting piece which is of cylindrical form, extending from the center of the piston head to the upper side of the wrist pin.

The connecting rod is cut away at the top of the wrist pin and the aluminum supporting piece rests against the upper side of the wristpin with a bearing fit. This gives a solid column of support from the center of the top of the piston straight down to the lower connecting rod bearing, through the support piece, the wristpin and connecting rod.

Oiling System Well Designed

The oiling system has been particularly well worked out. The oil supply is carried under the seat and amounts to 7 gallons. It is fed to the crankcase under pressure and then distributed by the force feed pump through five independent leads. Four of these are to the main bearings and the other enters the hollow camshaft at the rear and passes through it in a thick stream. There are leads drilled to each of the five camshaft bearings and the shaft itself runs submerged in oil. The oil then passes out the front end of the camshaft and through a lead to the timing gears which are supplied very liberally. A lead is also taken off to the water pump and magneto shaft bearing, the oil then passing back to the crankshaft for recirculation.

The crankshaft is in two pieces and is carried on four ball bearings. The rear bearing is double, giving two single bearings for front and center and the double bearing in the rear.

The motor is mounted in a subframe, which also contains the gearset. The subframe is mounted flexibly at three points, the front support being a single trunnion in the center of the cross member and the rear supports ball and socket connections back of the gearbox, which is amidships.

Ball bearings are used throughout the three-speed gearset, the main gearset shaft extending through the driven member of the clutch and connected to it by a squared section. The end of this shaft rests in the center of the flywheel. This fixes the alignment of the motor and gearset and the whole flexible subframe could be swung as much as a foot out of line without affecting the drive.

Hotchkiss drive is used and a ratio of about 3 to 1 with 35-inch wheels will probably be fixed upon, although this is not as yet certain. The axle housings are swaged from solid steel tube under 40 tons pressure.

All of the center housing of the differential is of aluminum. The bearings used throughout the rear axle are ball. In fact, this type of bearing has been used liberally even for a racing machine. Each of the timing gears for instance has two ball bearings and the pressure of a finger is sufficient to rotate the entire set.

A neat feature in the chassis is in the clutch. The cone is of steel and behind it there is a fiber to steel clutch brake, the fiber being between two steel disks. Every detail of the car is special and the only stock parts are the wheels and shock absorbers. The springs are semi-elliptic all around and the wheel base is 106 inches.

Seven gallons of water are carried in the radiator, jackets and connections. The radiator is a square tube type made especially for this car by Fedders. It has a false front made up of a removable screen placed 3 inches in front of the radiator proper. The pump being on the same shaft as the magneto, runs at magneto speed and is of the impeller type.

Gasoline is carried in a tank located in the aluminum tail piece. The tank capacity is 29 gallons and it is calculated that as the consumption will be a little better than 11 miles per gallon, the car will go through if need be without renewing the supply.

The Peugeot to be driven by Charles Merz will have the motor described and the old Grand Prix Peugeot chassis also stiffened up and revamped by the Premier company.

The new Premier cars will be purchased by the Indianapolis Speedway Corp., and will be raced by them with Anderson and Rooney as drivers. These men are now working at the Mais plant on the cars.

Frontenacs Are Ready

The three Frontenac entries for the Indianapolis grind are now completed and ready for their trials. Louis Chevrolet is the designer, and he has built three beautiful cars that are constructed more extensively aluminum alloy than any other motor vehicle yet to come before the public. Every conceivable unit or part of a unit that could be made of the material has a place in these Frontenacs, which tip the scales at the surprisingly low weight of about 1,750 pounds as a result.

The motor is almost all aluminum—cyl-

inders, pistons, crankcase, intake manifold, camshaft cover and gear covers, water pump, oil pumps and other lesser parts are made of the metal—but this is not nearly all. The body, with its cigar-shaped stern, is a sheet aluminum affair; the main parts of the rear axle are cast from this light material, these being principally the gear housing and the brake flanges. Other parts that come from the foundries making aluminum accessories are the clutch cone, pedal brackets, gearcase, starting crank bracket, and last, but not least, the long underpan which covers the car underneath for its entire length.

Have to Uphold Contention

Thus the Frontenacs will have to uphold the contentions of the aluminum exponents as no other cars in this year's speed contests will. On them will rest the proof of the value of the extensive use of the metal for severe service, and those interested in the Frontenac Motor Co. are not worrying any.

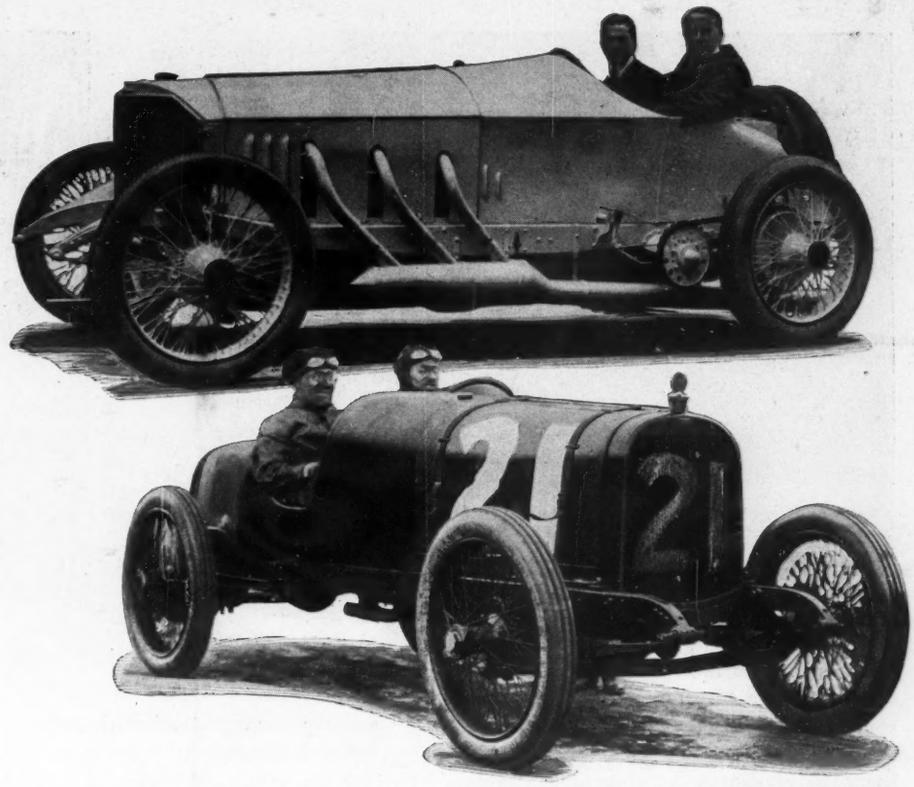
Chevrolet will drive one of the cars, and Arthur and Gaston Chevrolet will be the pilots of the other two in the Indianapolis meet. Joseph Boyer is relief pilot.

Louis Chevrolet is chiefly responsible for the design. Last fall he built his first machine under the Frontenac name, and the new creations are product of the same experience, the same Frenchman's courage and cleverness. He knows what is in the cars and, barring the unforseen, each undoubtedly will give an excellent account of the cars in competition with the world's best.

Chevrolet fixes the horsepower of the new engine he is using at 135 to 140, resulting from a bore of 3.870 and a stroke of 6.375 inches. He uses a compression of 105 pounds per square inch, and has four valves per cylinder, the inlets being 2 inches in diameter and the exhausts 1¾ inches. The camshaft is overhead, and actuates the valves through rocker arms, the four for any one cylinder being inclosed by an aluminum plate that is individual for that particular set. Compensating springs are fitted to the valves so as to insure absolute following of the cams even at very high speeds. Drive for the camshaft is attained by a vertical shaft at the front, which is connected to camshaft and crankshaft by bevel gears, both upper and lower sets being completely housed within an aluminum housing. The valve seats are cast in the aluminum cylinder block, and all four for one cylinder are in one piece—a new wrinkle even for this newest of cylinder and valve constructions.

To insure the best possible cylinder casting, the sides and ends of the water jackets are open, and aluminum plates are securely fastened to the openings to form the completed water space. Thus uniformity of the cooling area is attained at the same time, and further lightness in the bargain.

Three ball bearings carry the crankshaft, and in order to get the center one in place, the shaft is split into two parts securely bolted together by substantial steel bolts. The shaft is of large proportions with very large webs so that vibration from this source should be almost nil. The pistons are of a special type that might be termed an umbrella form, although the writer does not know whether this name has ever been applied to the design. The piston upper part, carrying two rings, extends down only a little over an inch, and joins the portion containing the wristpin bosses through an extension of the inner center, and this part flares below the wrist pin to make the lower skirt which is drilled with holes to lighten it. Thus maximum cooling is attained with minimum weight and bearing surface.



Above—De Palma and his reconstructed Mercedes. Below—Vail in the Hudson at Sheepshead Bay

Connecting Rods Hollow Steel

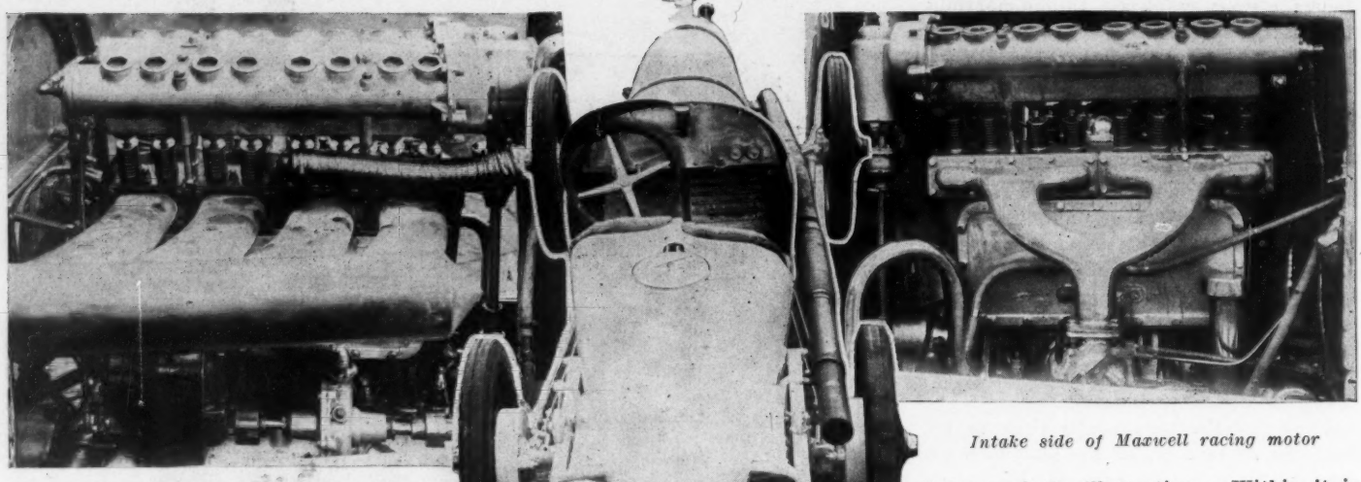
Hollow steel connecting rods of surprisingly light weight are also a part of these featherweight cars. These are machined all over and balanced to a nicety that should be conducive of most excellent results. Four bolts hold each machined cap in place, and at the wrist pin end there is a provision for a steel pin to hold the wrist pin in place and cause it to have its bearing in the bosses of the piston.

Chevrolet has given a great deal of thought to the oiling system and methods of cooling the lubricant. Directly in front of the dash is located a 12-gallon semi-circular oil reservoir, the entire front of which is provided with copper cooling fins. The underpan of the engine and a metal shield below this tank completely trap the inrushing air that comes through the radiator, and force it to pass over these fins in order to get out. Thus any air that enters the radiator must pass over the front of the oil tank before it can get out. This is really a forced-draught scheme, and excellent results are expected with it. In connection with this tank arrangement, two independent oil systems are fitted, so that should trouble come to one, the other will adequately take care of the requirements. Two gear pumps are driven by the magneto and waterpump shaft on the left. The oil is forced from the tank directly to the crankshaft bearings and some by-passes to the overhead camshaft at the front end. From the rear end of this unit the oil is led down to the oil sump at the bottom of the motor. From the crankshaft main bearings the oil is led through centrifugal rings on the shaft to the connecting rod lower bearings, and the spray from these gets to the cylinder walls and wrist-pin bearings. In addition there is a pump at the mechanician's hand that forces oil directly from the tank to the bearings. One of the gear pumps takes its supply from the sump.

Four-Point Suspension

The motor is supported in the frame at four points on steel tubing, and is entirely separate from the gearset which is amidships on three points. This makes a very sturdy layout, allows the flywheel to be completely open, and reduces the weight. Drive is by the Hotchkiss method, using an open propeller shaft with two universals and long semi-elliptic rear springs that measure 45 inches.

No differential is used in the axle, as is often the case in racing machines, and



Intake side of Maxwell racing motor

View of Maxwell motor showing exhaust tube

Rear view of the new Maxwell showing streamline effect

Chevrolet has allowed himself some latitude in the matter of gear ratio. He has three sets of gears available for each car, these being 2¼ to 1, 2⅓ to 1 and 2½ to 1. It depends upon the results obtained with each when the cars are put on the track to fix which will be employed finally.

An unusual but very logical location has been given the gasoline tanks. Two long and narrow reservoirs are hung below the frame and alongside of the gearbox and drive shaft on either side. These will serve to distribute the weight and put more of it where it belongs at the back end of the car, thus making it hold the track better at speed, and undoubtedly effecting the speed at which the cars can take the turns. Putting this tank weight low, the center of gravity is brought down considerably. The piping is arranged so that either feeds the carbureter, and there are shut-off cocks from each, running close to the mechanicians' seat, with filler caps in the floor boards.

Chevrolet has undoubtedly designed a beautiful body. It has a graceful sweep, and is shaped for the minimum of wind-resistance, with a pointed tail, narrow radiator and sloping without external obstructions to set up eddies. The curve of the underpan follows the same lines and makes the whole thing look like a big cigar. The wheelbase is 104 inches.

Flexible Steering Wheel

One very clever feature of the cars is the flexible steering wheel, if it might be called such. In racing the driver gets much of the jarring and vibration of the track, this being transmitted to his hands and wrists through the steering wheel. To absorb this continuous jarring, the arms of the steering wheel spider are made up of three thin plates that have somewhat the same action as a leaf spring. Thus the wheel can be moved a maximum of 1 inch up or down from its normal plane, and this ability to absorb shocks should result in less tiring of the driver's arms and wrists.

Some of the accessories and parts that have been incorporated in these Frontenacs are Bosch magneto, Zenith carbureters, Rudge-Whitworth wire wheels, Gemmer steering gears, Goodrich Silvertown cord tires and K. L. G. air-cooled spark plugs.

The Maxwells

These cars follow in most respects the design developed by Ray Harroun for the Maxwell racers of 1914 and 1915, but have a number of minor changes incorporated intended to increase their stamina and speed.

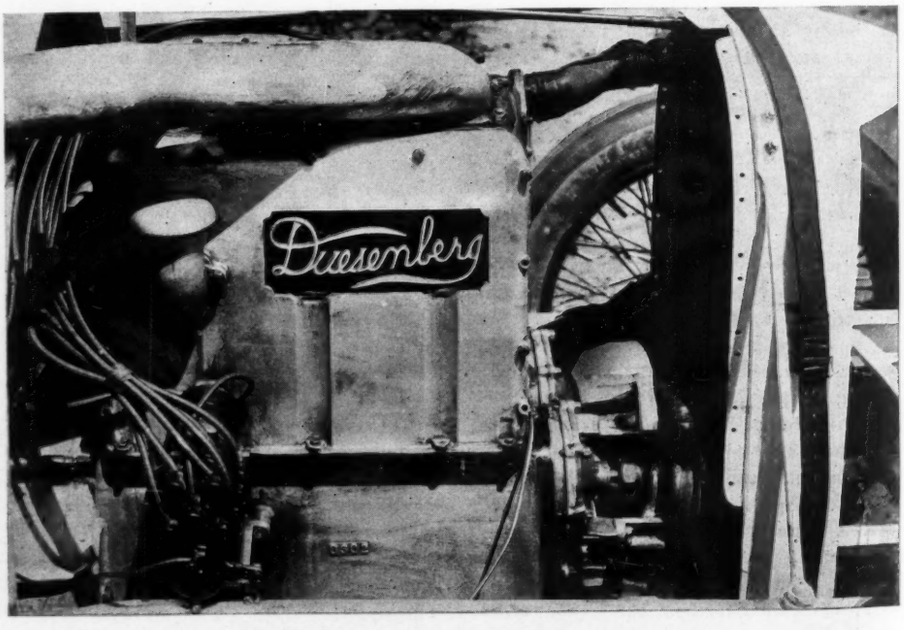
So far as the cars themselves are concerned, there has been a striking change exteriorly in the appearance of the Maxwells. Instead of the stub-ended rear portion of the earlier cars, a long tail has been fitted, designed to a true streamline form and thus cut wind resistance to the minimum. The shape of this tail is shown in two of the illustrations. Within it is carried the fuel tank of very large capacity, and with an exceptionally large opening, by which a can of gasoline can be dumped into it in record time. This is the main fuel supply, and is by pressure. In addition there is an auxiliary fuel supply of less capacity, carried in the cowl, and which feeds by gravity, so that if the main supply becomes exhausted, the driver can run in on the auxiliary by throwing a valve underneath the steering wheel.

The oil supply is carried in the torpedo-shaped tank underneath the middle of the left frame member with quite short connections to the triple oil pump, a feature which will be explained later.

Bore 3¾; Stroke 6¾

The motors incorporate the only other changes from last year's practice. In most respects they are identical with the 300-inch sixteen-valve motors of the Maxwell team of 1915. Like those motors they have a bore of 3¾ and a stroke of 6¾. These dimensions bring the displacement to just within the limit. To be exact, it is 298.2 cubic inches.

The valve sizes have been changed



Compact Duesenberg power plant on Crawford racer

slightly, the intakes being increased to 2 inches; this is ¼ inch greater diameter than in the 1915 racers. The exhaust valves have not been changed, but the lift of all valves has been increased to ⅛ inch, the cams opening now $\frac{7}{16}$ of an inch.

The divided intake manifold of the 1915 cars has given way to a more direct and probably more efficient intake in which the whole side of the cylinder head casting above the intake valves is opened up to the gas, thus giving a blanket of fresh gas over the entire intake valve area.

Oiling System Changed

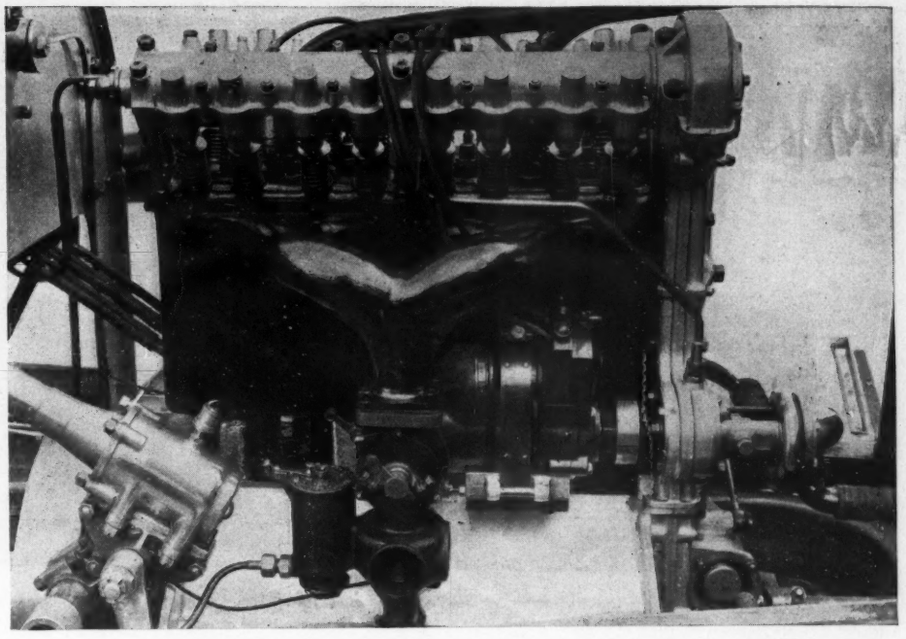
The oiling system has been changed somewhat, chiefly through the use of a triple gear pump instead of a double one employed earlier. The system is a force-feed circulating one in which fresh oil is drawn continually from the oil tank under the frame, and returned to the latter after use. This keeps the oil cooler than would be possible otherwise.

The real feature of the Harroun motor as exemplified in these Maxwells of the Prest-O-Lite team is the unique crankshaft construction. This has not undergone any change from last season.

Connecting rods still are made of chrome-vanadium steel and have been subjected to accurate machining over all. The I-beam section is further strengthened by forcing webs on either end of the section, making a very sturdy rod.

The use of magnalium pistons is continued, magnalium being an exceedingly light and strong alloy. The piston heads are domed to give them strength, and each has five rings. There are two diagonally split rings in each of the upper grooves and one wider ring below which is used for a retainer for the wrist pin. The use of magnalium reduces the piston weight from over 2 pounds, the weight of a similar cast-iron piston, to about 15 ounces.

In explanation of the counterbalanced crankshaft, it might be explained that the flywheel function is distributed along the entire length of the crankshaft and is conducive to fine engine balance. The counterbalance weight opposite each rod bearing is equal to the weight of the lower part of the rod and its bearing, thus the active forces are balanced with respect to the center of gravity and the centers of masses revolve in the same or parallel planes. Vibration is materially reduced thereby.



Carbureter and magneto side of Peugeot racer

Driven at 98 M. P. H.

That the cars are fast Rickenbacher has proven already, as he turned one lap of the Indianapolis speedway at the rate of 98 miles an hour, he says, and the writer timed him at better than 96 miles per hour. This is a better showing than his win at New York.

The Sunbeam

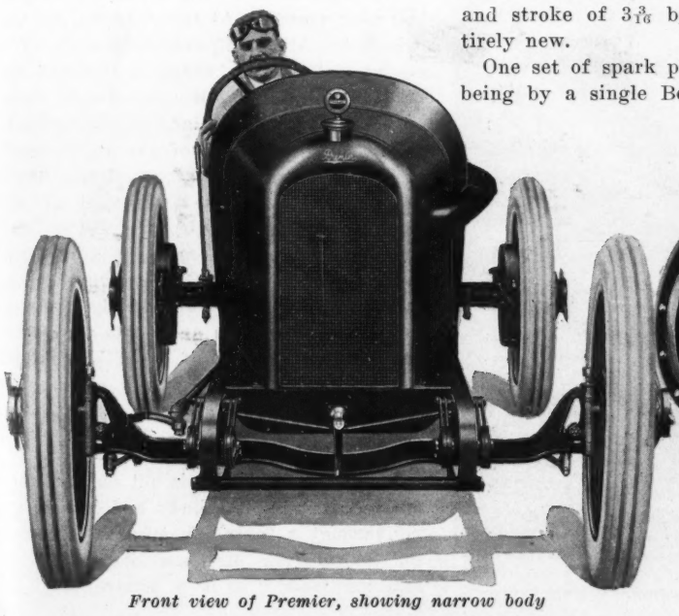
The chassis of this car is the same that appeared in several races in this country in previous years, but the motor, which is a six-cylinder type with a bore and stroke of $3\frac{3}{16}$ by $5\frac{7}{8}$ inches, is entirely new.

One set of spark plugs is used, ignition being by a single Bosch magneto driven at three-quarter engine speed. There are two oil pumps, one for the ball bearing crankshaft and the other for the two camshafts. The motor has a single breather pipe to each cylinder as shown in the illustrations.

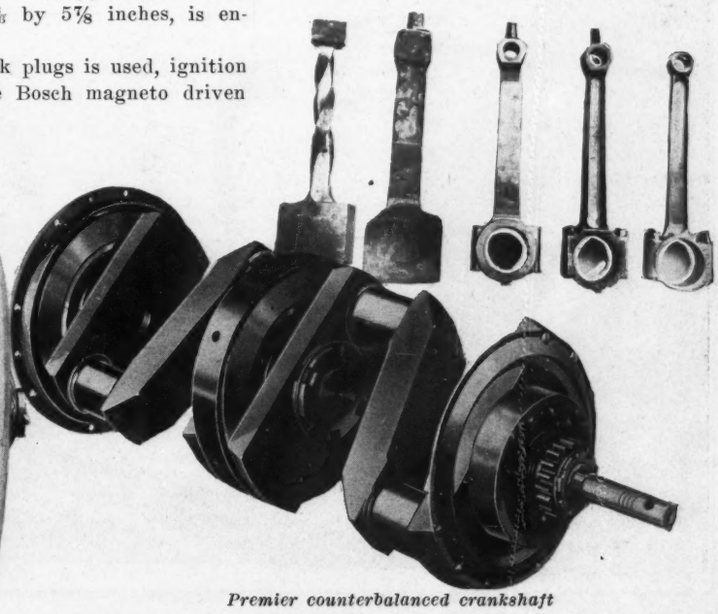
There are four valves to each cylinder, making twenty-four valves in all. The camshafts are mounted overhead, the valves being set at an angle in the top of the cylinder head and the camshafts are driven by a vertical shaft and gears from the front of the engine.

Two carbureters are used, with a separate intake manifold for the three forward and three rear cylinders respectively.

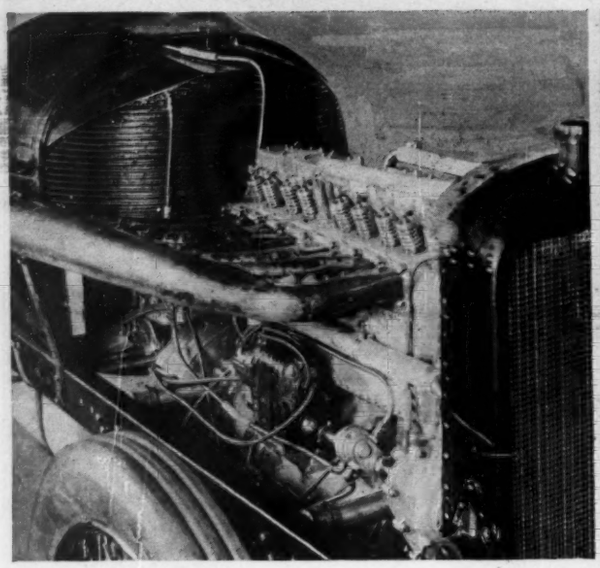
An interesting detail of the block casting is the fact that the jacket walls are as much as possible of aluminium, while the passages cored out for the inlet and exhaust ports are smooth and direct, the inlet pipe being expanded into a wide



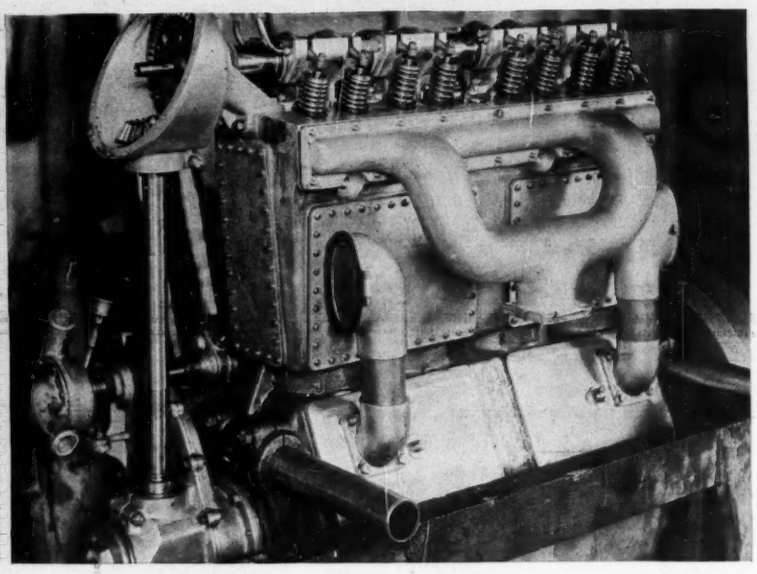
Front view of Premier, showing narrow body



Premier counterbalanced crankshaft



View of Frontenac engine, showing exhaust header and oil tanks on front of cowl



Intake side of aluminum engine used in Frontenac. Note drive of camshaft is by bevel gears

mouth, resembling rather the nozzle of a vacuum cleaner, in order to eliminate sharp corners.

Being a six-cylinder engine, the crank case is a particularly stiff and rigid structure, each of the ball journal bearings being of large size. As usual the pistons are mainly holes with a little metal around each, while the connecting rods are very light.

A four-speed gearset is employed and the gear reduction on direct drive is 2.7 to 1. There is a revolution counter fitted. The exhaust manifold is carried outside the hood and is pointed at the forward end.

Externally the body is very much neater than most of the Sunbeam racers, every corner made by the rectangular petrol tank behind the driver being rounded off in the external paneling and the long tail tapering to a sharp point. The undershield has no big projections to disturb the air, and a ratchetless brake lever is the only mechanism placed outside the body.

The car has been driven for about fifteen laps on the Brooklands track in England, but no high speeds were made due to the bad condition of the track caused by army trucks, and neglect.

The Crawford

The sixteen-valve Duesenberg motor used in the Crawford cars should also be of great interest in the coming race and in other events on the national circuit. This motor is the one which was experimented with last year but which was completed too late to be used in any of the events. It is built very much along the same lines as the eight-valve Duesenberg, having the valves operated by long rocker arms on the side. These rocker arms extend up the side of the motor and act directly on horizontally-placed valves located above the cylinder.

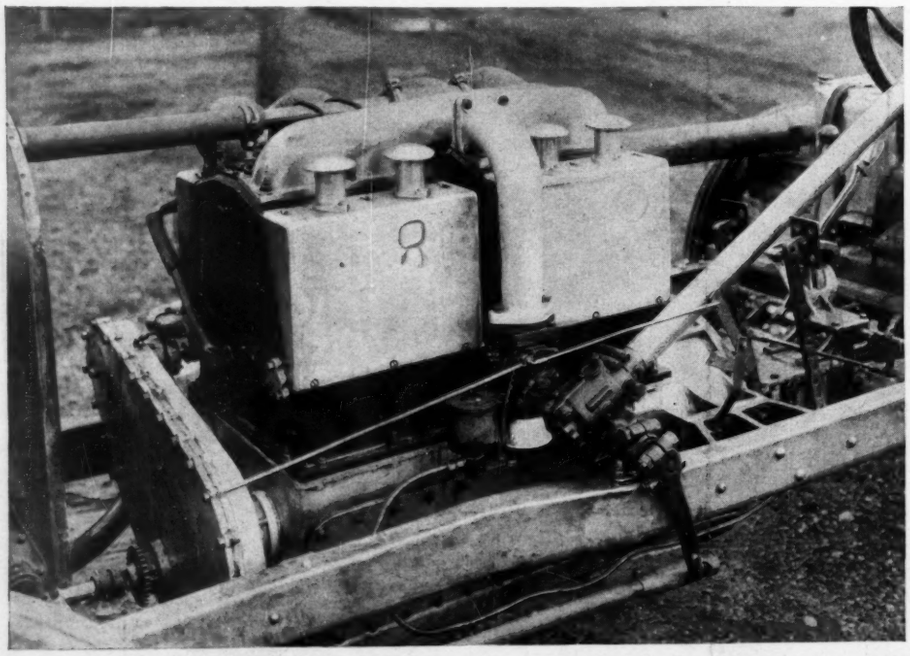
The Duesenbergs

The three new Duesenbergs which are just being completed in the new quarters at Chicago look to be much speedier than any mount O'Donnell has had—certainly they look faster. Not only have they the sixteen valves which featured the new motor of last year, but the very light tubular connecting rods and extraordinarily sturdy crankshaft, make the new motors very powerful. In addition, the cars are considerably lighter, and will scale close to 1,800 pounds. The characteristic turtleback has given way to a pointed tail and a pointed nose is fitted. We may look for O'Donnell to figure in the East to almost as great an extent as he has in the West, this season.

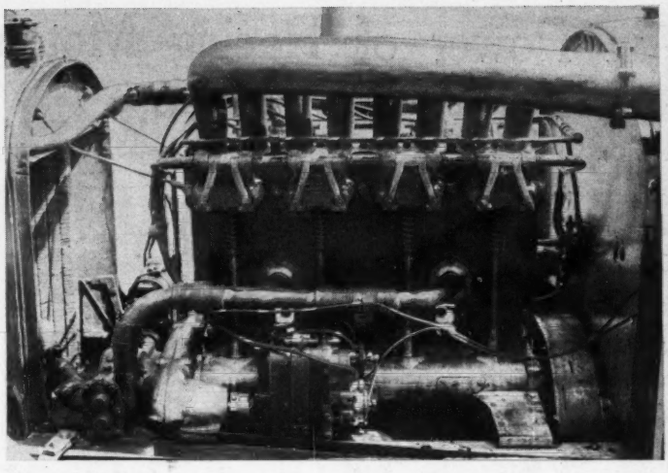
The Duesenberg motor stood up well in last year's races. At Indianapolis, the car driven by Alley suffered no trouble of a mechanical nature beyond a loosened exhaust pipe. O'Donnell stopped only three times at Indianapolis and his mechanical adjustments consisted of the replacement of a nut which had jarred off the brake bracket and a quick adjustment of the shock absorber. Mulford's Duesenberg was put out of the race by a stripped direct drive clutch. On the whole these cars performed very consistently throughout the entire season and while they were not as fast as some of the other entries were generally in the money on account of their steady performance.

Mulford Special

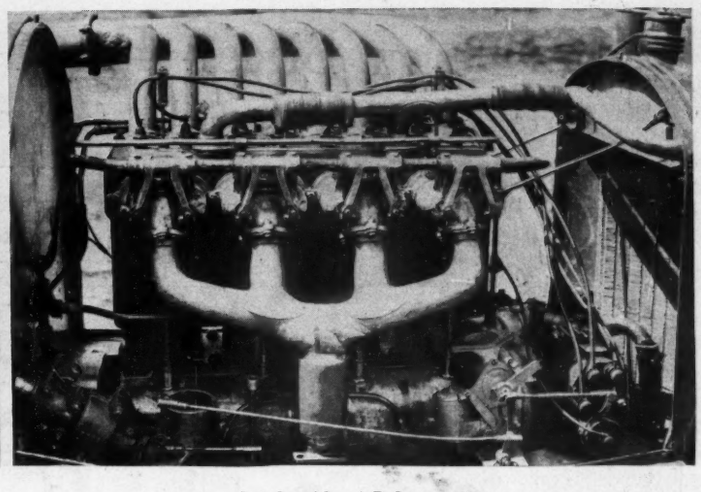
The Mulford Special is out on the track without its complete body and is now going through a tuning-up process. The motor in this car discloses little from an exterior view. It is a square block in



Intake side of Mulford Special, showing compact construction



Delage motor, showing overhead exhaust tubes



Intake side of Delage motor

appearance, having four cylinders 3.98 by 6, giving a piston displacement of 299 cubic inches. The valves are operated by vertical rocker arms.

The Delages

The three Delages which took part in the French Grand Prix and have been imported by Henry Harkness, the New York sportsman, were given their bow to the American public at Sheepshead Bay May 13. They have been described in detail in Motor Age issue of March 30. Their special novelty is a set of sixteen poppet valves, each of which is closed positively by a cam as well as opened by one, the spring acting only as a cushion.

There are three cams to each pair of valves; the midmost lifts the valve by pushing down a stirrup that surrounds the cam, and the two outside cams bear upon the side pieces of the stirrup and pull the valves shut, acting through two springs.

The two camshafts are driven by a single vertical shaft with a nest of bevel gears at the upper end, the spark plugs being in the center of the cylinder heads. A small peculiarity is that the cylinders are bolted on from beneath the studs fitting in the cast iron foot with the nuts inside the aluminum crankcase.

There are two Claudel carbureters on each engine, operating simultaneously with throttles interconnected.

Because of the very hilly nature of the last Grand Prix circuit in France five speeds are provided with direct on third, and the nature of the road also dictated the use of the large front wheel brakes. In addition to these there are a pair of brakes on the rear wheels and a transmission brake as well.

The engines are well within the 300 cubic inch limitation, being 94 by 160 millimeters, or 3.7 by 6.3 inches. This gives a piston displacement of almost exactly 270 cubic inches. The wheelbase is 106 inches, and the tires 34 in diameter on Rudge-Whitworth wheels.

The Peugeots

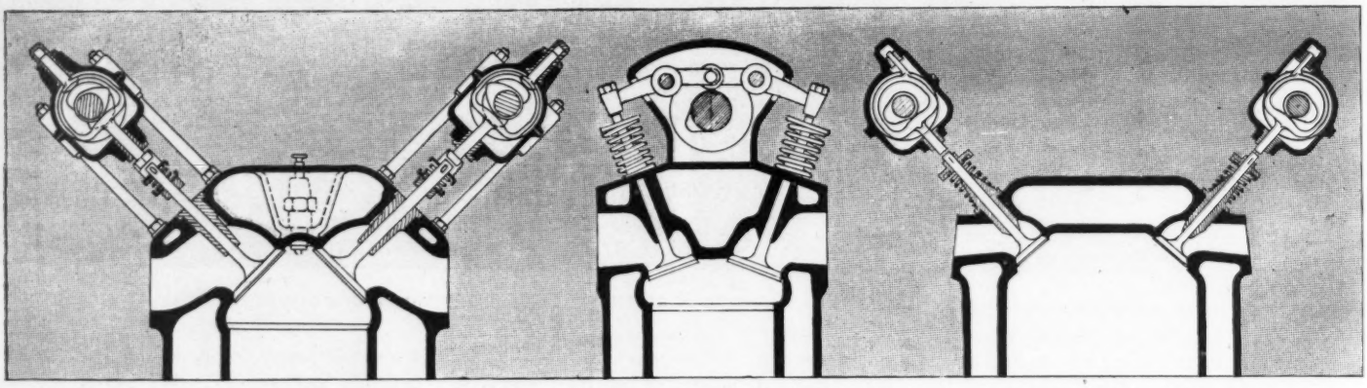
The Peugeots likewise are 16-valve engines and all of them have seen service here last year. They have been described in detail previously. Cast-iron cylinders, with four valves per cylinder and two overhead camshafts, driven by a train of spur gears at the front end, specify the motor, and the crankshaft bearings are ball. Lubrication is by drip feed through a row of sight feeds, which lead to the bearings and sundry other parts, the circulation being maintained by pump and supplementary hand supply. Resta is now at the track tuning up his mount and judging from some of the laps made he will be an aggressive contender next Tuesday.

Indianapolis Speedway Time Chart—Miles Per Hour Equivalents

MILES PER HOUR	1 Lap 2½ Miles	4 Laps 10 Miles	20 Laps 50 Miles	40 Laps 100 Miles	80 Laps 200 Miles	120 Laps 300 Miles	MILES PER HOUR
	Min. Sec.	Min. Sec.	Min. Sec.	Hr. Min. Sec.	Hr. Min. Sec.	Hr. Min. Sec.	
60	2 30.00	10 00.0	50 00	1 40 00	3 20 00	5 00 00	60
61	2 27.54	9 50.2	49 11	1 38 22	3 16 43	4 55 04	61
62	2 25.16	9 40.6	48 23	1 36 46	3 13 33	4 50 19	62
63	2 22.86	9 31.4	47 37	1 35 14	3 10 29	4 45 43	63
64	2 20.63	9 22.5	46 52	1 33 45	3 07 30	4 41 15	64
65	2 18.46	9 13.8	46 09	1 32 18	3 04 37	4 36 55	65
66	2 16.36	9 05.4	45 27	1 30 55	3 01 49	4 32 44	66
67	2 14.33	8 57.3	44 47	1 29 33	2 59 06	4 28 39	67
68	2 12.35	8 49.4	44 07	1 28 14	2 56 28	4 24 42	68
69	2 10.43	8 41.7	43 29	1 26 57	2 53 54	4 20 52	69
70	2 08.57	8 34.3	42 52	1 25 43	2 51 26	4 17 09	70
71	2 06.70	8 27.0	42 15	1 24 30	2 49 00	4 13 31	71
72	2 05.00	8 20.0	41 40	1 23 20	2 46 40	4 10 00	72
73	2 03.29	8 13.2	41 06	1 22 12	2 44 23	4 06 35	73
74	2 01.62	8 06.5	40 32	1 21 05	2 42 10	4 03 15	74
75	2 00.00	8 00.0	40 00	1 20 00	2 40 00	4 00 00	75
76	1 58.42	7 53.7	39 28	1 18 57	2 37 54	3 56 51	76
77	1 56.88	7 47.5	38 58	1 17 55	2 35 51	3 53 46	77
78	1 55.38	7 41.5	38 28	1 16 55	2 33 51	3 50 46	78
79	1 53.92	7 35.7	37 58	1 15 57	2 31 54	3 47 51	79
80	1 52.50	7 30.0	37 30	1 15 00	2 30 00	3 45 00	80
81	1 51.11	7 24.4	37 02	1 14 04	2 28 09	3 42 13	81
82	1 49.76	7 19.0	36 35	1 13 10	2 26 20	3 39 31	82
83	1 48.43	7 13.7	36 09	1 12 17	2 24 35	3 36 52	83
84	1 47.14	7 08.6	35 43	1 11 26	2 22 51	3 34 17	84
85	1 45.88	7 03.5	35 18	1 10 35	2 21 11	3 31 46	85
86	1 44.65	6 58.6	34 53	1 09 46	2 19 52	3 29 18	86
87	1 43.45	6 53.8	34 29	1 08 58	2 17 56	3 26 54	87
88	1 42.27	6 49.1	34 05	1 08 11	2 16 22	3 24 33	88
89	1 41.12	6 44.5	33 42	1 07 25	2 14 50	3 22 15	89
90	1 40.00	6 40.0	33 20	1 06 40	2 13 20	3 20 00	90
91	1 38.90	6 35.6	32 58	1 05 56	2 11 52	3 17 48	91
92	1 37.82	6 31.3	32 37	1 05 13	2 10 26	3 15 39	92
93	1 36.77	6 27.1	32 15	1 04 31	2 09 02	3 13 33	93
94	1 35.74	6 23.0	31 55	1 03 50	2 07 40	3 11 29	94
95	1 34.74	6 18.94	31 35	1 03 09	2 06 19	3 09 28	95
96	1 33.75	6 15.0	31 15	1 02 30	2 05 00	3 07 30	96
97	1 32.78	6 11.1	30 56	1 01 51	2 03 43	3 05 34	97
98	1 31.84	6 07.3	30 37	1 01 13	2 02 27	3 03 40	98
99	1 30.91	6 03.6	30 18	1 00 36	2 01 13	3 01 49	99
100	1 30.00	6 00.0	30 00	1 00 00	2 00 00	3 00 00	100

Valve Design Biggest Factor in Power of Racing Motors

Arrangements Controlled by Constr uction Permitting Greatest Intake and Exhaust of Gases



Delage system with valves closed by cams *Mercedes and Stutz design with rockers* *Peugeot type which is most widely used*

MOTORS in racing have been brought to such a degree of perfection in the past few years that engineers have little more to work on than the one feature of inducing a number of cubic inches of gas proportionate to the cubic inch displacement of the cylinders, to enter, burn and pass out of the engine in perfect succession without one process conflicting with another. When the modern engineer builds a racing motor, it is not a great exaggeration to say that he first designs his valve gears and then fits the rest of his engine to it.

The power of a motor of given size is directly proportionate to the amount of gas it can burn, since each cubic foot of properly mixed gas and air, when fired, produces the same amount of heat. For this reason, it is the engineer's task to combine the greatest number of revolutions per minute with the largest possible percentage of gas charge on each suction stroke. The task of feeding this charge to the cylinders and allowing it to pass out again falls upon the valves, and if the valve area restricts the amount of gas that can enter the cylinder at a given time the force of the explosion, and consequently the power is reduced.

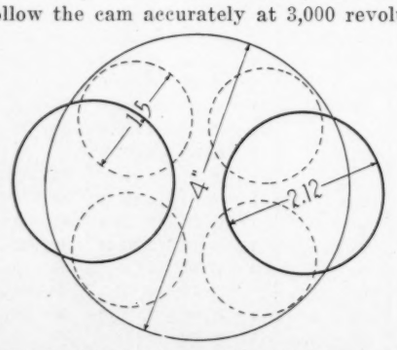
The available space into which valves can be put is limited inasmuch as, to get the best compression ratio, the total volume of the charge when compressed must not exceed about one-fifth of its uncompressed volume. The reason that four-valve motor design is now most usual in racing cars, is because such a construction permits reduction in weight per valve, consequently allowing them to be opened and closed more rapidly than two of the same area which are necessarily much heavier.

The weight of a valve head varies roughly in proportion with its area, and the area varies with the square of the diameter. Since the small valve does not require the same thickness of head as the large one, the weight increases actually more rapidly than the diameter squared. With a doubled diameter the weight is multiplied by four and then increased again by a substantial addition to the thickness of the head.

To appreciate the forces acting on a valve and the duties imposed upon the valve spring, let us suppose that, in a motor turning 3,000 revolutions per minute, which means that the camshaft is revolving 1,500 revolutions per minute, the acceleration period of the valve—that is, the period of accelerative lift from its seat—is .00294 seconds. This figure is arrived at by assuming that the valve remains open for a total angular movement of the camshaft of 105 degrees, and that the acceleration period lasts about a quarter of the 105 degrees, namely 26.5 degrees, during which travel it will have lifted half its total lift.

If half the lift is .2 inches and the weight of the valve 4 ounces, then the force necessary to produce the acceleration is approximately 15.5 pounds. Add the weight of the tappet and half the weight of the spring plus the spring pressure and it will be at least doubled.

Furthermore, the spring has to do just the same work during the first half of the closing movement of the valve that the cam has to do in the first half of opening movement, thus a 4-ounce valve, if it is to follow the cam accurately at 3,000 revolutions per minute of the crankshaft, may easily need a spring of considerable power.



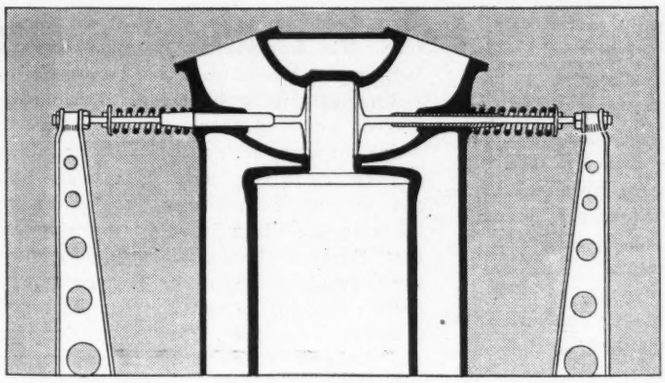
Showing Relative Proportions of Two Valves and Four Valves for a 4-Inch Bore

Now assume the valve is double the diameter, which means four times the weight and more. Take the weight as being just 1 pound and the force required increases to 62 pounds, considering only the valve and neglecting the tappet, etc. Add the other masses and a spring giving a pressure of 120 pounds or so is the least that will be required.

Suppose the bore and stroke are 4 inches by 5 inches, which is about right for a 300 cubic inch four-cylinder engine; and suppose that we allow a mean velocity of 200 feet per second through the inlet valve, which is a normal velocity, then the area of inlet opening needed is approximately 3.15 square inches. Allowing for the fact that the valve cannot be fully open for more than a small part of its period, we shall need at least 3.5 square inches of valve area.

Now a single valve of 3.5 square inches area will be 2.12 inches in diameter. Two valves to have the same total area, 3.5 square inches, will have to be a shade under 1.5 inch in diameter each. The strength of spring required will be in proportion to the diameters squared as explained before, namely in the proportion 449 to 225, which means that the pressure throughout the valve mechanism will only be half the amount for the small valve that is necessary for the large one.

There is still another advantage in the lighter units. A very strong spring needs heavy wire and the rapidity of spring action is dependent upon the section to some extent. A heavy spring is bad, first, because of its weight, and second, because it is more sluggish in action than a spring of lighter section. Incidentally, it has been found that where a spring pressure of 80 pounds is required, faster action may be obtained by using two 40-pound springs, one within the other, than by employing one spring of full 80-pound strength.



Duesenberg Principle of Horizontal Side-Valves

The arguments applying to the inlet valves also apply to the exhausts, of course, though the need for size is a trifle less important.

Two Valves Most Efficient

Taking another aspect of the case; suppose we start with a circle 4 inches in diameter and imagine this to be the top of the piston. On top of this draw two circles of 2.12 inches and also four circles each 1.5 inches. This makes obvious the fact that two valves will necessitate a combustion head with a bulge on each side while the four valves will practically locate within the 4-inch circle.

Instead of placing the valves with the stems vertical they are usually put at an angle of something near 45 degrees and this allows good water space all around each valve seat, while giving the necessary small combustion space. Also the combustion space thus becomes of a shape which approximates to a hemisphere, and that is the best shape from the viewpoint of thermal efficiency.

There are many ways of arranging the four valves because, after the valves themselves have been designed, there remains the need for locating the parts to work them. Just as the weight of the valve is of paramount importance, so is the weight of the tappet or rocker to operate the valve. The least weight of valve-operating mechanism is got by following the Peugeot school of design, in which there are two cam-shafts contained in aluminum housings, mounted directly over each row of valves so that the axis of the valve stem passes through the center of the cam. In this design the cam is separated from the valve stem by a very short distance, just enough to allow for a short push rod to connect the cam with the valve that will have a long enough bearing in the case to prevent too much oil leakage.

The drawback to this design is that the two camshafts with their necessary driving gears make for complication and, though the valve parts are kept low in weight, the total mass of the two camshafts, etc., is a consideration.

Alternately there is the older design developed by many manufacturers, of using one overhead camshaft placed centrally over the cylinders, the straight tappet rods of the Peugeot type being replaced by small rockers. This cuts down the complication and reduces the total weight, but the rockers are almost impossible to make so that their reciprocating mass is as small as the little push rod in the Peugeot. Results, however, show that practically the same power output is obtainable with either design. Prominent users of the rocker construction are Mercedes and Stutz.

The old design where the camshaft was in the usual place in the crankcase and the valves operated by long push rods is impossible for racing today, as the long rods cannot be made light enough. It has been suggested that the action could be reversed and pull wires substituted for push rods, but the idea has never been tried and does not sound very promising.

Another school of design, which differs in detail though not in principle, is exemplified by the Duesenberg and the old Delage engines. Here the four valves are used just the same, but they are not set at 45 degrees in the head; instead they have the stems horizontal and open into a high, narrow combustion head, rather like the usual combustion space stood on end. For operating the valves there is a camshaft on each side of the crankcase and, in the Duesenberg motors, long rockers, set vertically, connect the cams with the ends of the valve stems. The old Delage had a different scheme. There were two camshafts in the crankcase, each operating four long push rods. On either side of the cylinder block was a rocker shaft, placed above the valves and running from end to end. On this shaft were rockers with three arms, of which one was lifted by the push rod while the other two pressed on the valve stems. Delage has since abandoned this design because the reciprocating weight of the push rods and rockers was too great, and the older Delage cars are therefore a sort of half step between the L-head motor and the Peugeot type of overhead valve construction.

Though it has been described many times, the new Delage system cannot very well be omitted from a review of this character. Externally the present Delage racing engine looks very much like a Peugeot, and the difference is all within the camshaft case. Each cam is surrounded by a stirrup, the cam pressing on one side to open the valve and on the other to close it, the stirrup being attached to the end of the valve stem through the medium of a very small but stiff spring which is in slight tension when the valve is shut. The idea is to eliminate the lag of the spring altogether and to shut the valve just as positively as it is opened.

The theory underlying the four-valve engine with overhead camshaft has been known and appreciated for very many years, and the reason why it is only recently that four-valve motors have been made is that the older racing cars gave so much trouble with other parts of the engine that the extra volumetric efficiency given by the four valves could not have been utilized without breaking up the rest of the motor. At present there is nothing in view that appears likely to displace the four-valve type after the fashion in which it has displaced the two-valve.

Ignition Nerve Center of Power Plant

Broken Wire Connection May Spell Defeat

NO one function of the success or failure of a racing car has more importance wrapped up in its well-being than the ignition. It is the nerve force, the vitality of the car. Sever the nerves of a giant and though his great muscles still remain, he is powerless. Sever a wire or break a connection somewhere in the ignition system of the racing machine and gone are all the effects of triumphs in material and power production.

All the problems of the touring car are multiplied a hundredfold. Higher temperatures to work against, higher speeds, sustained high pace and all the hundred and one attacks against the fortress of endurance made during the race grind are felt either directly or indirectly by the ignition system. It must be right.

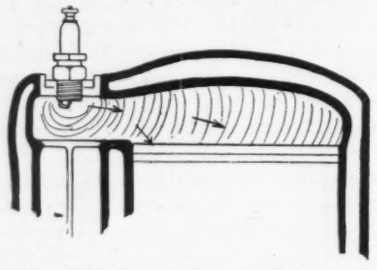
Most of the vital conditions which necessarily must be obtained are focused right down to one prime objective: Instant combustion at top dead center. It is impossible to obtain instant combustion and since top center is occupied by the piston only for one infinitesimal period of time, it is impossible to have the entire explosion take place at that point. Nevertheless, by fixing the attention on achieving the ideal, the nearest possible is obtained.

It is the spark that changes the latent energy in the fuel into the driving effort. It is necessary to have the driving effort secured from the measured quantity of gasoline that passes into each cylinder as great as possible. The ideal explosion condition named is one of the greatest factors in accomplishing this result and reducing to a minimum the amount of power thrown uselessly through the exhaust.

Knowing what is desired, the methods used to obtain the result become readily

intelligible. Quick combustion is a prime requisite. If it was desired to burn a strip of paper as quickly as possible, the best method of procedure would be to light the paper at several points. If it had to be burned as quickly as possible and only one point of ignition were allowed, that point would naturally be the center of the paper, allowing the flame to propagate itself radially from this point.

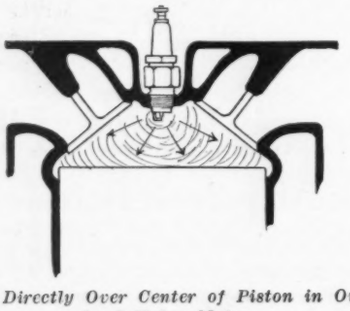
Thus it is in the racing car. Quick ignition being necessary, a large proportion is using the two-point ignition. It has been said that this phase is falling off, but if it is so, it is because combustion chambers



Plug Located Over Valves in L-Head Motor

themselves are now of more highly-concentrated volume, allowing a single spark to do the work much more rapidly than before and also, incidentally, reducing the space permitted for plugs to such a degree that it is only possible to fit one. In the Sheepshead Bay race in New York, of the eighteen cars to start, seven were fitted with two-point ignition and the others with single plugs.

The hot spark at high speeds, which is the greatly-desired feature in racing, falls in well with the characteristics of the



Plug Directly Over Center of Piston in Overhead Valve Motor

magneto and hence this has been supreme for the past few years. One exception has been noted, however, this year in which the battery-equipped Hudson went through to third position in the New York event without showing ignition trouble of any kind during the run.

It is commonly believed that in the two-spark magneto the sparks at each one of the plugs is weakened by the fact that two instead of one have to be supplied. This is not true, as the electrical characteristics involved by the ratio of the high-tension to the low-tension winding are entirely different in the two instruments. In other words the two-spark magneto is not simply a single instrument with a double distributor, but on the other hand is primarily a different design electrically as well as mechanically.

Wiring, Not Juice, That Fails

It is in the mechanical side of the ignition system for racing cars that the greatest difficulties enter. Broadly speaking, there is no such thing as electrical trouble. Given the proper mechanical conditions, electricity will not fail to do its part. The high temperature at the spark plugs furnishes a good example of this. In operating the motor at the temperatures obtained in racing, the insulation and the electrodes are submitted to stresses that would never be reached under other conditions. The consequence is that in the long races we see plug failures.

There is only one way to keep the plugs cool and that is by proper waterjacketing. At the same time the wall supporting the screwed connection of the plug must be firm enough to endure the wedge action necessary in tightening the plug. This has been worked out in the cars of this year much better than in the past, and at the Sheepshead Bay track plug changes were very scarce. In the 300-mile event at Indianapolis there undoubtedly will be more of them on account of the greater distance. Nevertheless the troubles as a whole have been greatly reduced.

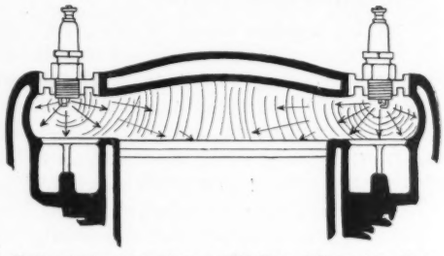
The difficulty in getting material has hampered the plug makers to a great degree. The Bosch company had its last plug stand at the Sheepshead Bay race. Owing to the fact that this concern can no longer secure the Steatite used in the insulation of their plugs the further manufacture has had to await changes in conditions.

One of the interesting ignition systems of the year from a mechanical standpoint is that used on the Sunbeam car of Christaen's. This is a six-cylinder car and ordinarily a magneto used with it would have to be driven at 1½ engine speed in order to produce the three sparks per revolution necessary with the four-cycle six-cylinder engine. The magneto on Christaen's car produces four sparks per revolution and hence is driven at three-quarters engine speed.

This reduction of the armature shaft speed of the magneto by using a type which produces four sparks to the revolution is important in high-speed work. If the magneto is driven at a greater speed than that of the crankshaft it becomes the fastest moving part on the car. The armature shaft bearings are stressed to a much higher degree, not only due to the higher rate of travel but also to the thrust of the step-up gearing. The result is that the bearing life on the armature shaft is apt to be shortened. This same effect has shown itself to be true on lighting generator shafts on passenger cars where they were operated at a higher speed than the crankshaft.

The care in detail work on the ignition systems is even better now than ever before although the ignition system has always been carefully watched on racing cars. The improvement is in the better location of the wires and the precaution against chafing or breaking. This is not perfect yet and there are some cars in which the wires are not as neatly tied down as they might be. That accidents can happen to even such things as high-tension leads to the plugs is shown by the fact that Eddie Rickenbacher had to stop in the Sheepshead Bay event on account of a broken lead to the number four plug.

Taken altogether, racing ignition has not changed in any material respect, but throughout the entire system there is a greater reliability. Plugs are lasting better because they are better cooled. Broken wires are fewer, because they are fastened in place with more care, such things as broken magneto straps, etc., which used to be responsible for putting good cars out



T-Head Construction with Two Plugs Sparking at the Same Time

of a race have been reduced until it can really be said that in the racing cars for the 1916 season the ignition is one of the most reliable parts of the car.

CO-OPERATION BY EXPORTERS

Washington, D. C., May 19—The immediate clarification of the Sherman anti-trust law and all laws supplementary thereto by the enactment of a declaratory amendment specifically permitting American business men to combine for the extension of export trade, employing "any methods of organization which do not operate to the prejudice of the American public and are lawful in the countries where the trade is to be carried on" is urged upon Congress in a report which has just been forwarded to the Senate by the Federal Trade Commission.

The commission's report has been made in response to a resolution of the Senate adopted soon after the commission was created directing an exhaustive investigation of the question of foreign competition and an expression of opinion as to the necessity and propriety of amending the existing anti-trust laws. The commission finds: "First, that other nations enjoy marked advantages in foreign trade from superior facilities and more effective organizations; and second, that doubt and fear as to legal restrictions prevent Americans from developing equally effective organization for overseas business and that the foreign trade of our manufacturers and producers, particularly the smaller concerns, suffers in consequence."

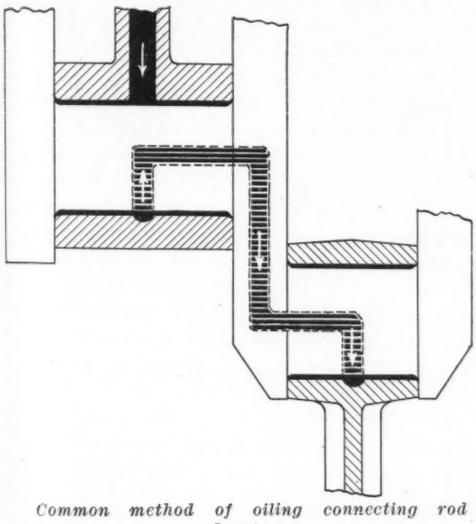
Continued Speed Taxes Oiling System

Plain Bearing Motors Prove Easier to Lubricate

JUST after the Sunbeam had burned a connecting rod bearing in finishing the 50-mile race at Sheepshead Bay, May 13, Jack Lecain remarked that none of the foreign racing cars were in use until American mechanics had fixed their lubrication system to suit speedway conditions. He alluded to the undoubted fact that many European racing cars were designed for road work where corners and gradients provide easy spells to the engine.

On the speedway the demand on the motor is continuous. The load put upon the bearings in the first lap is maintained until the end of the race, unless there be a stop for some other reason. This being so, the conditions are different from those of road racing.

In Europe there is only one speedway, this being Brooklands track in England.



Common method of oiling connecting rod bearings

There it has been the habit to run a number of short races once a month. Very seldom is the distance covered more than 10 miles, so, even in England, racing car builders have not had to face the necessity for building engines to give maximum power continuously for over an hour.

It may be asked why the engine which lubricates itself sufficiently for 5 minutes should not continue to do so for an hour or more. The answer is that a racing engine continues to increase in temperature for quite a long time after it commences to work.

Suppose, for example, that the piston received from the explosion 100 units of heat and that, between one explosion and the next, the piston is able, by reason of its design, to transmit all the 100 units to the cooling water, then the engine will run continuously without the occurrence of piston trouble. Suppose, however, that the piston is only able to dissipate 99 units of heat between one explosion and the next, then every explosion will put into the piston one unit of heat more than is taken away from it by the cooling water. The piston expands a little for each unit of heat put into it. The number of units required to expand it to a point where it will begin to get tight in the cylinder, depends upon the design. Thus, if the piston is gaining heat slowly, the engine may be able to run satisfactorily for, say, 10 minutes with the piston getting hotter all the time. At the end of the 10 minutes, the surplus amount of heat in the piston may easily have reached a point where it will begin to be tight in the cylinder. This is one reason why the fact that the engine will run at full power for 5 minutes is only partial evidence of its ability to run at full power for an hour.

That which applies to the piston applies to every part. The friction of the bearings heats up the crankshaft, camshaft and piston pin. The general rise in temperature of the whole motor heats the oil itself. Increasing temperature causes expansion of various parts and may thus cause a reduction in the tolerances figured upon by the engineer. As the oil grows hotter its lubricating power decreases. So, if the normal working temperature of any part is underestimated in the original design, then the lubrication almost certainly will prove defective if the engine is run continuously for sufficient length of time.

Connecting Rod Bearings Troublesome

The bearings in a racing engine which are most liable to give trouble are the lower and upper ends of the connecting rods, because these bearings are subjected to the greatest pressure per square inch. There are two alternative designs for the crankshaft. One has plain bearings both for the crankshaft itself and for the crank pins. The other has plain bearings for the pins and ball bearings for the shaft. The object in using ball bearings is not so much to cut down the friction or to avoid the necessity for high pressure lubrication, as it is to reduce the overall length of the engine and thereby cut down its weight. The Peugeot engineers were the first to employ ball bearings successfully in a racing engine, and they used this type because they wanted to have the lightest possible car so as to obtain the maximum acceleration and hill climbing for road racing in France. These ball bearings gave no trouble, and consequently the Peugeot design has been copied very extensively, or perhaps it would be fairer to say that many other engineers have taken advantage of the experiments made by the Peugeot company, and have therefore adopted ball bearings without any fear as to the results.

On the other hand, the principal opponents of the Peugeot have always adhered to plain bearings.

On the score of lubrication there is something to say for both systems and the conditions of working are contradictory. For example, the ball bearing requires practically no oil; it needs just enough to prevent it becoming quite dry. A plain bearing, on the other hand, needs all the oil which can be supplied to it. Thus, if the main bearings of a crankshaft are of the plain variety it will be necessary to supply them with oil under pressure, whereas, if they are ball bearings, a very little oil will suffice.

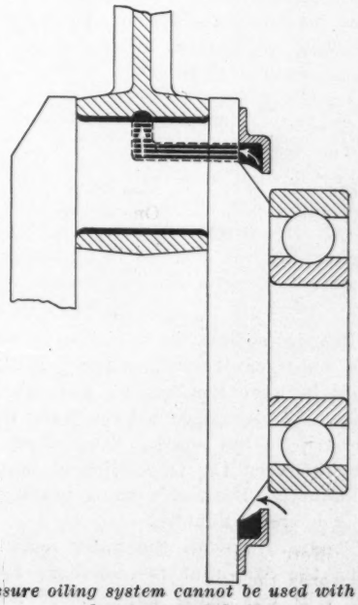
Most Vital Bearing

Coming now to the most vital bearing of the engine, the lower end of the connecting rod, all attempts to utilize balls or rollers at this point have been futile. The punch of the explosion drives the balls into the race and the life of a ball race in a connecting rod is very short. It is therefore usually assumed that the lower end bearings must be plain.

If the main crankshaft bearings are plain, it is easy to pump oil to them under high pressure and to transfer it through holes drilled within the crankshaft to the crankpins, whence it will be discharged under the same pressure, or almost the same pressure, inside of the lower end connecting rod bearings. This is an argument in favor of plain bearings against ball.

Where ball bearings are used there is no ready means for pumping oil to the crankpins for there is nothing on the center part of a crankshaft to hold the oil in and convey it to the drilled holes at all corresponding to the long bushing of a plain bearing. Thus, engineers employing ball bearing crankshafts must depart altogether from the pressure fed oil system, and design the lower end bearings so that they can be adequately lubricated with oil under no pressure.

It has already been pointed out that the advantage of the ball-bearing crankshaft is the ability it gives to shorten the whole length of the engine. Naturally some of



Pressure oiling system cannot be used with ball bearing crankshafts

this saving can be utilized by increasing the width of the crankpins, and increasing their size of course decreases pressure per square inch on the crank pins. Having proceeded thus far, it generally is considered necessary to carry oil by some means or other directly to the lower end bearing surfaces.

The way this is done in the Peugeot and in practically all other engines using ball bearings, is to drill a radial hole in the crank pin and then another hole lengthwise of the pin, the orifice being brought to the back of the adjacent crank web. To the crank web there is then attached a hollow ring of brass or steel and the oil pump supplies small pipes which discharge jets of oil into each of these rings. Centrifugal force maintains the ring completely filled with oil and the only escape is through the hole drilled in the crankpin. This supplies oil to the lower end bearing under a very slight pressure, the important thing being to have the holes large enough and the oil pump supply sufficiently copious to insure the maintenance of a more than adequate quantity of oil within the rings on the crank web.

The record of lubrication failures in racing is not sufficiently full to allow of very accurate deduction, but there is little doubt that the system of bearing lubrication necessary for the ball-bearing crankshaft is more delicate than for plain bearings which permit a pressure feed right through to the crankpin.

Forced circulation of oil has two advantages. Firstly, the pressure easily displaces small particles of dirt, and secondly, the rapid passage of oil through the bearing in the pressure system makes the circulation more rapid and thus tends to keep down the mean temperature of the oil. Still these advantages are only small ones and are very largely offset by the reduction in size and weight made possible by use of the ball-bearing shaft.

So much for crankshaft lubrication. We come now to the piston and piston pin. For the latter forced lubrication is sometimes employed where there is high pressure oil fed to the lower end bearings; the small pipe carried by the connecting rod usually takes an adequate supply of oil to the piston pin and the overflow can be conducted to the cylinder walls. With a ball-bearing crankshaft there are two alternatives for lubricating the piston and the piston pin.

One which is used fairly extensively is to provide dip troughs and to put splashers on the connecting rod caps so that a large supply of oil is kept in the air within the crankcase. The other is to take oil pipes direct from the pump to the cylinder walls and, when this is done, it is usually possible to arrange the pipes so that the ends of the hollow piston pin register with the holes in the cylinder walls on the bottom of each trough, a supply of oil being then pumped straight into the piston pin. Incidentally it may be interesting to remark that this was one of the things which the late Bob Burman did to the Peugeot car with which he put up so many fine performances last season.

Cadillac Eight Sets New Coast Record

Makes Los Angeles-San Francisco Trip at 48.4 Miles Per Hour

SAN FRANCISCO, Cal., May 18—T. J. Beaudet today established a new Los Angeles-San Francisco motor car record of 9 hours, 37 minutes, when he piloted an eight-cylinder Cadillac from Los Angeles to the Bay City at an average speed of 48.4 miles an hour.

The last 147 miles were driven in a heavy downpour of rain.

Beaudet was officially checked out from North Broadway and Ave. 20 at 9:00 last night. He was checked in at Market and Guerrero Streets, San Francisco at 6:37 this morning.

Beaudet's time, in addition to beating the motor car record, is the fastest ever made between Los Angeles and San Francisco. Carrier pigeons have made the air line trip in ten hours. The fastest train time between the two cities is 13 hours, 45 minutes, Beaudet's mark beating this by 4 hours, 7 minutes.

The run was all the more remarkable from the fact that the northern half of the trip was made under most adverse weather conditions. The rain commenced just outside of Modesto, and from that point to San Francisco was continuous.

The first half of the trip was made under ideal weather conditions, with a bright moon and a cool night. The car reached Fresno in 5 hours, 6 minutes. The average speed to this point was nearly 50 miles an hour, despite the fact that the Ridge Route, with its 365 curves, can be driven at an average of only 30 miles an hour.

With this record, the Cadillac has announced its retirement from the road record field in California. At the request of the State Highway Commission, no more inter-city records will be attempted in this state.

INSPECT ILLINOIS VALLEY WAY

Joliet, Ill., May 19—A party of motorists which included Governor E. F. Dunne, members of the Illinois State Highway Commission and of the Illinois Valley Way Association, tonight concluded an inspection tour from Peoria to this city over the new scenic highway which follows the Illinois river valley from Chicago to Peoria.

This route, which will be known as the Illinois Valley Way, has been transformed from an impassable road in many places to a good highway, and for a large part of the way has been designated as a State-aid road. The party left Peoria at six this morning, passing through Chillicothe, where a 30-minute stop was made at the Peoria Automobile Club for breakfast, after which the route included Sparland, Henry, Bureau, Peru, LaSalle, Starved Rock State Park, where luncheon was served under the auspices of the Ottawa Rotary Club, and then through Ottawa and Morris to Joliet. The Will County Automobile and Good Roads Association served dinner for the caravan tonight at Joliet.

MOTOR CAR INSURANCE STATISTICS

Chicago, May 19—Indemnities amounting to $5,918,025 were paid to motor car owners in 1915 by insurance companies writing policies covering property damages. This is the figure given in the annual report of C. W. Van Beynum, motor car insurance statistician of Chicago.

An increase of 21 per cent in premium income for the year 1915 over the previous year is reported among the casualty companies. The total premiums paid to the fire and marine stock companies on motor car insurance were $13,036,138, not including the business of the mutuals, which Mr. Van Beynum estimates to have been approximately $2,000,000 on policies covering fire, theft and collisions. There are shown to be about 100 stock companies now writing floater business. Only sixty of these companies were in business during 1914. It is estimated that the casualty companies collected in the neighborhood of $22,000,000 in premiums on liability, property, damage and collision insurance last year.

ASPHALT BEST FOR EFFICIENCY

Boston, Mass., May 20—Asphalt is more nearly perfect of all the paving material used in so far as resistance to truck operation is concerned. This fact was brought out by Professor D. C. Jackson, of the Massachusetts School of Technology, as the result of a series of tests to determine just what the difference in resistance due to various kinds of pavement and the condition in summer or in winter. It was found that wood block came next to asphalt and when in good shape very nearly equal to the latter. Brick pavement ranks third and macadam fourth. It was further found that dust cuts down the infrequency of the motor truck on any kind of paving although the ratio is somewhat smaller for asphalt than for any of the other kinds of street surfacing in general use.

Whom Indianapolis Has Honored

1914 Thomas-Delage
Time 6:03:45-82.47 M.P.H.

1913 Goux-Peugeot
Time 6:35:05-76.92 M.P.H.

1915 De Palma-Mercedes
Time 5:33:55.51-89.84 M.P.H.

1911 Harroun-Marmon
Time 6:42:08-74.59 M.P.H.

1916 ?

1912 Dawson-National
Time 6:21:06-78.7 M.P.H.

Misty Ghosts of Former Deeds Haunt Famous Speedway

Glorious Victories and Heart-Breaking Failures Mark Events of Previous Years

WHEN the big day arrives that you are seated in the grandstand at Indianapolis nervously chewing a cigar, or, sex reversed, shaking your head at that howling green sport coat on the opulent woman in the box ahead of you, your tumultuous thoughts will waver between any of a hundred sights that are going on before your eyes. Concentration on one thing, the race, will come at the wave of the starting flag. Until then, chaos. It is no time to reminisce. Could you spare a moment from the excitement, it might be soothing to the nerves, to look back upon the glorious victories, or the bitter defeats which have torn the soul of many a driver in years gone by, on the same track that is spread before you.

Yes, you remember, vaguely, that a man named Harroun, you guess he is a designer now, drove a long thing called the Marmon Wasp to victory in 1911, or was that the year? Let us mention the name of Samuel Dickson. Did you ever hear it before? Ten to one you didn't. Sam was as brave a man as any of the winners but he was killed when the Amplex in which he was pumping oil and Greiner was driving lost a tire and turned over in the 1911 event. He was not a driver, he did not win—he is forgotten. Many an intrepid sportsman has spent a winter slaving in a dingy workshop with a few hungry helpers piecing together the mechanical outgrowth of his ideas of an Indianapolis winner. Many of that same kind have burst in print with the following, "entered but failed to qualify." Some of them have the heart to try again, but it takes a heart. Morbid thoughts you will say, but we shudder with the man whose enthusiasm turns to salt, with a broken connecting rod.

1911

Let us go back for a moment and look over the victories and the failures of previous years. The first international speedway event in 1911 was crowded with thrills. Until the last lap, it was doubtful which one of the five leading cars would cross the tape first. Ray Harroun, riding alone in the Marmon Wasp, got the checkered flag 1 minute and 43 seconds ahead of Ralph Mulford, who wheeled a Lozier. Eight minutes and 38 seconds behind Mulford, David Bruce-Brown thundered under the wire for third place. Wishart, in his Mercedes, closely followed by Dawson in a Marmon, brought the first five prize winners to the finish within 13 minutes of each other. Such a finish has never been equalled since on the famous speedway.

Fate placed Dawson in the money. He bumped another car in the last part of the race and in the mixup his radiator was so badly jammed that it would not hold water. He finished the race with oil as the only cooling agent and had no more than crossed the tape when the motor stuck from the heat.

It was in this race that Samuel Dickson lost his life. Greiner, for whom he acted as mechanician, escaped with a few bruises. Dave Lewis, riding with Grant in the Alco, had his leg broken in a mixup with Disbrow's Pope-Hartford. Another smash in front of the grandstand injured Harry Knight and his helper, John Fuller; bruised Jagersburger's mechanic, C. L. Anderson, and was the cause of minor sprains to Bob Evans, mechanic for Jack Tower, who jumped from the speeding car.

Part of the glory of winning the race goes to Cyrus Patschke, who piloted the Wasp 100 miles, putting it in the lead. Mulford got second money despite the fact that he was obliged to make fourteen tire changes. Harroun only changed three.

1912

In the event of the year following, 1912, another Indianapolis-made car and an Indianapolis driver had the stamina which spelled victory. Joe Dawson, in a National, showed the way to a field of twenty-four cars, only ten of which finished. Dawson's average time of 78.7 miles an hour was a new record.

The following cars and drivers finished in the order named: Tetzlaff in a Fiat, Hughes in a Mercer, Merz in a Stutz, Endicott in a Schacht, Zengel in a Stutz, Jenkins in a White, Horan in a Lozier, Wilcox in a National and Mulford in a Knox.

Ralph de Palma was robbed of what seemed certain victory by engine trouble when he was within two laps of the finish. At the time he was 11 minutes ahead of Dawson. His car lacked the ability to withstand the terrific grind. It failed at the critical moment. He and his mechanician, Jeffkins, tragedy in their faces, pushed the car to the pits. The race was comparatively free from accidents. The only approach to a serious mishap occurred

STATISTICS OF THE 1911 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under.

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	32	Marmon, Harroun	6	4½	5	447.1	6:42:08	74.59
2	33	Lozier, Mulford	4	5⅜	6	544.6	6:43:51	74.29
3	28	Fiat, Bruce-Brown	4	5	7½	589.0	6:52:29	72.73
4	11	Mercedes, Wishart	5	5.1	7.1	580.2	6:52:57	72.65
5	31	Marmon, Dawson	4	4.5	7	445.3	6:54:34	72.34
6	2	Simplex, R. de Palma	4	5¾	5¾	597.2	7:62:02	71.13
7	20	National, Merz	4	5	5 11/16	436.8	7:06:20	70.37
8	12	Amplex, Turner	4	5 1/16	5	443.3	7:15:56	68.82
9	15	Knox, Belcher	6	5	4¾	559.1	7:17:09	68.62
10	25	Jackson, Cobe	4	5	5½	431.9	7:21:50	67.90
11	10	Stutz, Anderson	4	4¾	5½	389.9	7:22:55	67.73
12	36	Mercer, Hughes	4	4⅜	5	300.7	7:23:32	67.62

Running at the finish—Firestone, Frayer; National, Wilcox; Mercer, Bigelow; Inter-State, H. Endicott; Velie, Hall; Benz, Knipper; Benz, Burman; Simplex, Beardsley; Fiat, Hearne-Parker; Pope-Hartford, Fox; Cutting, Delaney; Jackson; Tower, McFarlan, Marquette; Cole, W. Endicott.

Also started—National, Aitken, 125 laps; Case, Jones, 122; Case, Strang, 109; Apperson, Lytle, 82; Alco, Grant, 51; Buick, C. Basle, 46; Pope-Hartford, Disbrow, 45; Buick, A. Chevrolet, 30; Fiat, Bragg, 24; Jackson, Ellis, 22; Lozier, Tetzlaff, 20; Amplex, Greiner, 12.

Entered but did not start—Fal, Pearce; Fal, Geinaw; Lozier, Van Gorder, scratched; McFarlan, Clemens; Velie, Gibbon, and Cole, Jenkins, failed to qualify.

STATISTICS OF THE 1912 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	8	National, Dawson	4	5	6¼	490.8	6:21:06	78.7
2	3	Fiat, Tetzlaff	4	5	7½	589.0	6:39:25	76.6
3	21	Mercer, Hughes	4	4⅜	5	300.7	6:33:09	76.3
4	20	Stutz, Merz	4	4¾	5½	389.9	6:34:40	76.0
5	18	Schacht, W. Endicott	4	4¾	5½	389.9	6:46:28	73.3
6	2	Stutz, Zengel	4	4¾	5½	389.9	6:48:31	73.2
7	14	White, Jenkins	6	4¼	5¾	489.4	6:52:38	72.7
8	22	Lozier, Horan	4	5⅜	6	544.6	6:59:38	71.4
9	9	National, Wilcox	4	5	7½	589.0	7:11:30	69.6
10	19	Knox, Mulford	6	4.8	5½	597.16	8:53:00	56.2

Also started—Mercedes, R. de Palma, 198 laps; Cutting, Burman, 156; Mercedes, Wishart, 92; Simplex, Dingley, 155; Lozier, Matson, 107; Stutz, Anderson, 79; Marquette, Leisaw, 63; Case, Hearne, 54; Firestone, Rickenbacker, 44; National, Bruce-Brown, 25; Lexington, Knight, 7; Opel, Ormsby, 5.

Entered but did not start—Mason, Lee Oldfield; Shambaugh, Shambaugh, and Continental, unnamed, failed to qualify.

STATISTICS OF THE 1913 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	16	Peugeot, Goux.....	4	4.246	7.875	448.13	6:35:05:00	76.92
2	22	Mercer, Wishart....	4	4.370	5.000	299.00	6:58:13:40	73.49
3	2	Stutz, Merz.....	4	4.813	5.500	399.97	6:48:49:25	73.38
4	9	Sunbeam, Guyot....	6	3.540	6.290	367.52	7:02:58:95	70.92
5	23	Mercedes-Knight Pilette	4	3.937	5.118	251.33	7:20:13:00	68.14
6	12	Gray Fox, Wilcox...	4	4.750	5.500	389.90	7:23:26:55	67.65
7	29	Mercedes, Mulford..	4	4.489	7.087	448.66	7:28:05:50	66.95
8	31	Case, Disbrow.....	4	5.100	5.500	449.00	7:29:09:00	63.08
9	35	Mason, Haupt.....	4	4.316	6.000	350.50	7:52:35:10	63.47
10	25	Tulsa, Clark.....	4	4.752	5.500	340.10	7:56:14:25	62.99

Running at the finish—Keeton, Burman.

Also started—Stutz, Anderson, 187 laps; Mason, Evans, 158; Anel, Liesaw, 148; Mercer, Bragg, 128; Henderson, Knipper, 125; Isotta, Tetzlaff, 118; Case, Nikrent, 67; Mason, Tower, 51; Isotta, Trucco, 39; Nyberg, Endicott, 23; Peugeot, Zuccarelli, 18; Mercer, R. de Palma, 15; Isotta, Grant, 14; Schacht, Jenkins, 13; Stutz, Herr, 7; Case, Endicott, 1.

Entered but did not start—Smada, Adams; Deltal, Dawson; Pennebaker, Pennebaker, scratched. Shambaugh disqualified for infraction of A. A. A. rules.

STATISTICS OF THE 1914 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	16	Delage, Thomas.....	4	4.13	7.08	380.2	6:03:45	82.47
2	14	Peugeot, Duray.....	4	3.07	6.18	183.0	6:10:24	80.99
3	10	Delage, Guyot.....	4	4.13	7.08	380.2	6:14:01	80.20
4	6	Peugeot, Goux.....	4	3.94	7.08	345.0	6:17:24	79.41
5	3	Stutz, Oldfield.....	4	4.80	6.00	434.3	6:23:51	78.15
6	9	Excelsior, Christiaens.....	6	3.80	6.20	446.6	6:27:24	77.44
7	27	Sunbeam, Grant.....	6	3.14	5.90	273.0	6:36:22	75.69
8	5	Beaver Bullet, Keene.....	4	5.10	5.50	449.4	6:40:57	74.82
9	25	Maxwell, Carlson.....	4	4.20	8.00	445.3	7:02:42	70.96
10	42	Duesenberg, Rickenbacker..	4	4.40	6.00	360.5	7:03:34	70.83

Finished—Mercedes, Mulford; Duesenberg, Haupt; Keeton, Knipper.

Also started—Peugeot, Boillot, 148 laps; Bugatti, Friedrich, 134; Burman, Disbrow, 128; Mercer, Wishart, 124; Stutz, Cooper, 118; Mercer, Bragg, 117; King, Klein, 87; Braender, Chandler, 69; Gray Fox, Wilcox, 67; Mason, Mason, 66; Burman, Burman, 47; Marmon, Dawson, 46; Stutz, Anderson, 42; Isotta, Gilhooley, 40; Maxwell, Tetzlaff, 38; Sunbeam, Chassagne, 20; Ray, Brock, 5.

when the right rear wheel of Burman's Cutting collapsed, causing an upset. Neither Burman nor his mechanician suffered injuries other than minor cuts and bruises.

1913

The 1913 event was a sweep for the foreign-made Peugeot, driven by Jules Goux. His time of 75.92 miles per hour, however, failed to scratch the record made by Dawson the year previous in his American-made National. Furthermore American cars were runners-up to the winner, beating out seven other European racers.

The race fairly effervesced with sensational happenings. During most of the event the winning Peugeot was constantly challenged for first place by Burman in his Keeton, who was finally obliged to fall back when his carburetor caught fire. Mulford in his Mercedes ran out of fuel in the backstretch.

Like the Marathon runners of old, his mechanic ran a mile across the infield to the pits and uttering a few jumbled words which told of his mate's plight, dropped unconscious in the arms of the pitman. The effort put Mulford in the prize money. To cap the list of sensations, Charlie Merz, driving a Stutz, covered the last lap with his car enveloped in a sheet of flames. His fiery finish brought him third money.

1914

A new record was set up in the 1914 event when Rene Thomas, in a Delage, completed the 500 miles at an average of 82.47 miles per hour. Foreign-made cars took the first four places, Duray's Peugeot being second, Guyot's Delage third and Goux's Peugeot fourth. Oldfield, in his Stutz, was the first American car to finish, his time being over 20 minutes behind that of the winner.

Foreign entries won six out of the ten money positions. It was a humiliation for the drivers of American cars.

The race was devoid of the sensational features which characterized the races of previous years. The crowd was brought to its feet but once and the flurry was caused by a thrilling mixup between Gilhooley in an Isotta and Dawson in the Marmon.

The former was permitted to race through the withdrawal of de Palma's Mercedes. His car did not have the speed and he was warned by the officials to keep to the inside rail. He gave no heed to the warning and his negligence brought disaster. In the south turn, running high up, he blew a tire and turned over. His dazed mechanic started to crawl up the track. Artful dodging got Wilcox past the stumbling helper, but Dawson was not so fortunate. He tried to go through the small space between the mechanic and the outside wall, but the resultant skid caused an upset. Only through heroic efforts were the doctors able to save Dawson's life.

1915

With the ghosts of previous disheartening defeats hanging over his head, Ralph de Palma drove his big Mercedes to a brilliant victory in the record-breaking grind of 1915. His time for the 500 miles at an average speed of 89.84 miles per hour made the former record of 82.47 miles per hour, made by Thomas the previous year, a shattered glory. Not only did he far exceed the time set by Thomas, but the three cars to follow, Resta's Peugeot, Anderson's Stutz and Cooper's Stutz, did likewise.

The respective averages of the cars to take second, third and fourth places, were 88.91, 87.60 and 87.11 miles per hour.

The achievement of the Stutz cars, as a team, was a most notable one, despite the fact that their drivers had to content themselves with places next in the list to foreign-built cars. Stutz started three cars and all finished within the money. Howdy Wilcox, a dangerous contender throughout most of the race, limped in on two cylinders to seventh place.

Duesenberg finished two out of the three cars entered. O'Donnell taking fifth and Tom Alley eighth. The late Bob Burman succeeded in nursing his car through the full 500 miles. It was the first time in his career that he did not pound his car to pieces or wreck it through daredevil driving, on the Indianapolis oval.

STATISTICS OF THE 1915 500-MILE RACE

Open to cars with a piston displacement of 300 cubic inches or under.

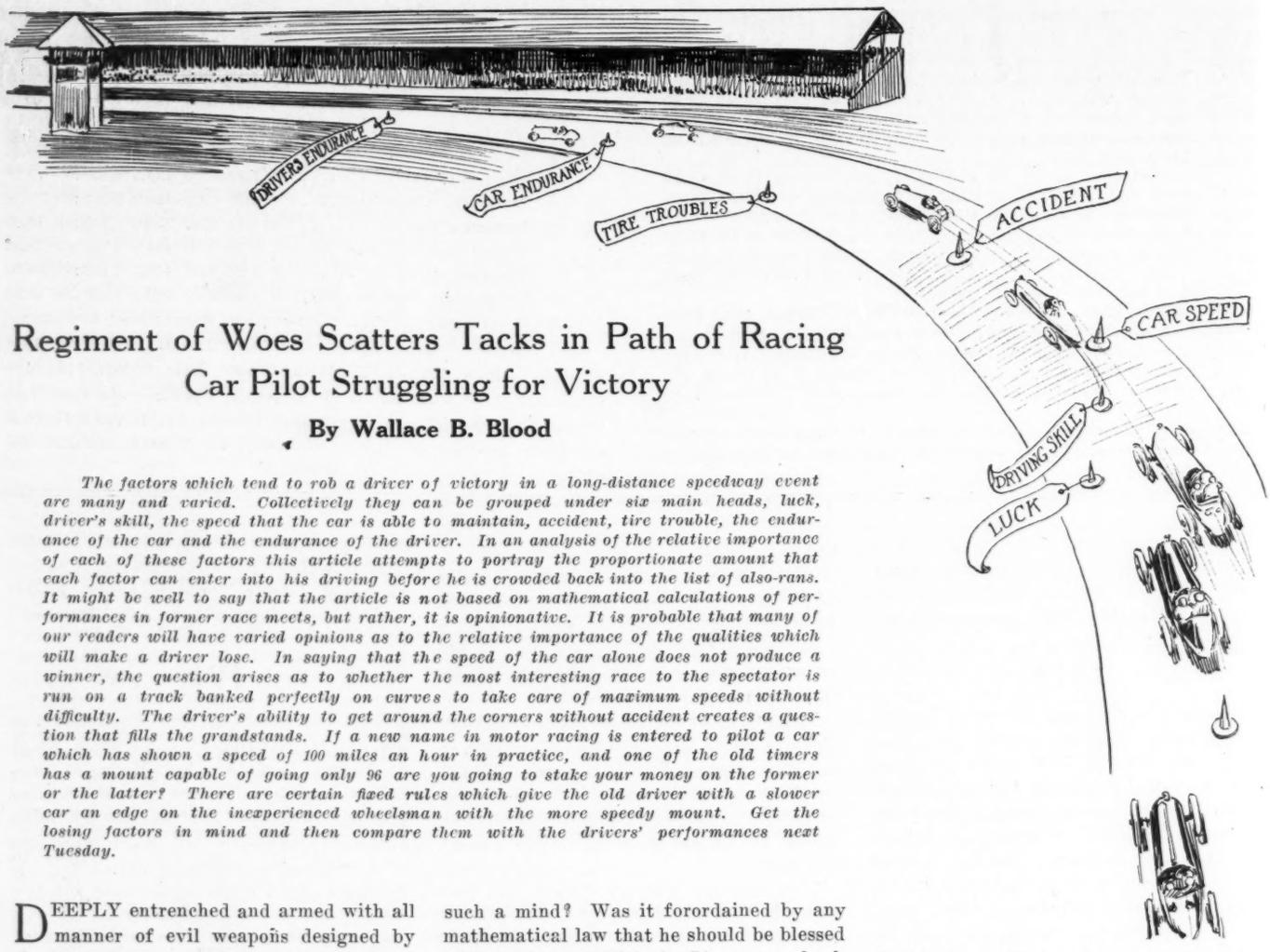
Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	2	Mercedes, R. de Palma	4	3.620	6.500	274.0	5:33:55.51	89.84
2	3	Peugeot, Resta.....	4	3.620	6.670	276.0	5:37:24.94	88.91
3	5	Stutz, Anderson.....	4	3.800	6.480	295.3	5:52:27.58	87.60
4	4	Stutz, E. Cooper.....	4	3.800	6.480	295.3	5:46:19.36	87.11
5	15	Duesenberg, O'Donnell	4	3.980	6.000	299.0	6:08:13.27	81.47
6	8	Peugeot, Burman.....	4	3.650	7.100	296.0	6:13:19.61	80.36
7	1	Stutz, Wilcox.....	4	3.816	6.484	298.5	6:14:19.73	80.14
8	10	Duesenberg, Alley....	4	3.980	6.000	299.0	6:15:08.01	79.97
9	19	Maxwell, Carlson-Hughes	4	3.750	6.750	298.0	6:19:55.90	78.96
10	7	Sunbeam, von Raalte..	4	3.700	6.300	274.0	6:35:23.43	75.79

Finished—Emden, Haupt.

Also started—Sunbeam, Grant, 184 laps; Maxwell, Orr, 168 laps; Sunbeam, Porporato, 164 laps; Sebring, J. Cooper, 154 laps; Duesenberg, Mulford; Peugeot, Babcock, 117 laps; Kleinart, Klein, 111 laps; Maxwell, Rickenbacker, 101 laps; Cornelian, Chevrolet, 76 laps; Delage, R. de Palma, 41 laps; Mais, Mais, 23; Bugatti, Hill, 20 laps; Purcell, Cox, 12 laps.

Entered but failed to qualify for final—Bergdoll, E. Bergdoll; Bergdoll, G. Bergdoll; Mercer, Ruckstell; Mercer, Nikrent; Bergdoll, Haupt; F. R. P., Hughes; F. R. P., Keene; F. R. P., Whalen; Harroun, Orr; Cino, McNay; Shambaugh, Shambaugh; Balls Special, J. Hill.

What Makes a Winner?



Regiment of Woes Scatters Tacks in Path of Racing Car Pilot Struggling for Victory

By Wallace B. Blood

The factors which tend to rob a driver of victory in a long-distance speedway event are many and varied. Collectively they can be grouped under six main heads, luck, driver's skill, the speed that the car is able to maintain, accident, tire trouble, the endurance of the car and the endurance of the driver. In an analysis of the relative importance of each of these factors this article attempts to portray the proportionate amount that each factor can enter into his driving before he is crowded back into the list of also-rans. It might be well to say that the article is not based on mathematical calculations of performances in former race meets, but rather, it is opinionative. It is probable that many of our readers will have varied opinions as to the relative importance of the qualities which will make a driver lose. In saying that the speed of the car alone does not produce a winner, the question arises as to whether the most interesting race to the spectator is run on a track banked perfectly on curves to take care of maximum speeds without difficulty. The driver's ability to get around the corners without accident creates a question that fills the grandstands. If a new name in motor racing is entered to pilot a car which has shown a speed of 100 miles an hour in practice, and one of the old timers has a mount capable of going only 96 are you going to stake your money on the former or the latter? There are certain fixed rules which give the old driver with a slower car an edge on the inexperienced wheelsman with the more speedy mount. Get the losing factors in mind and then compare them with the drivers' performances next Tuesday.

DEEPLY entrenched and armed with all manner of evil weapons designed by the law of chance and uncertainty to scar his path, a regiment of woes confront the driver of a long distance motor car race, each of which he must surmount before he can hope to reach the final goal in front of his competitors. A driver in a horse race has a thing of flesh and blood, a more or less fixed measure of possibility, to rely on in making his calculations. Not so with the pilot whose mount is man-made of steel units grouped into an intricate whole, each part unproven, liable to tear asunder and render the live mechanism a mass of twisted scrap metal.

There is, in the writer's opinion, a group of six abstract mountains over which the driver must climb with a greater degree of success than any of his rivals, before he can reach the pinnacle which spells victory. First of these, and possibly the one within which all others are included is the element of chance—luck. It has been said that the prime element of attainment in anything which is not strictly mathematical—that is which is not governed by an axiom—is luck. You might say that Thomas Edison did not attain his success, did not devise his wonderful creations, through luck. Granted! Was it not a matter of chance that Edison was born with such a mind? Was it forordained by any mathematical law that he should be blessed with such capabilities? If you go back far enough you will find that all great things are matters of circumstance. Many geniuses have died poor. Why? Because they did not possess the faculty of turning over to the people with a profit to themselves, the results of their genius.

Veteran Driver May Lose

So in motor racing, if the driver is of long proven ability, if his mount, or a car of similar construction has covered itself with glory in many previous events, he is still hounded by the ogres of fate. Take for example the heart-rending experience of Ralph de Palma who, in the 1914 Indianapolis race was leading until three miles from the finish when a broken connecting rod robbed from him the glory, and incidentally the money, he had come within a hair's breadth of earning.

After luck we put the next greatest factor in the ability of the car itself to perform the function for which it is intended. No matter how skillful the driver, no matter how free from accident, he is powerless if the car fails. Car endurance, let us call it. A loosened bolt, a broken valve, a crystalized steering part may either wreck the car and kill or injure the riders, or put it permanently out of the race. The driver has a big question mark before his eyes until coasting distance to the finish of the last lap.

Let us assume that all other conditions throughout the race are ideal. The car is capable of continuous high speed, the track is in perfect condition, mechanical and tire troubles are not a factor, but still the car does not finish on top. Then the blame rests on the driver. He lacked the experience, or the nerve, to crowd his speedy car past other drivers, possibly with slower cars, who knew the ropes. We place driver's skill as the third item in importance. Skill is not a constant factor. That is, drivers who have attained equal success do not drive alike. One may outline his entire race in advance, systematically, reeling off round after round within a second or two of the same time. Another may play stump-the-leader or may follow the leader, basing his speed on that of his nearest competitor. Both methods have won.

The speed of the car does not necessarily win a race. A car capable of attaining a speed of 90 miles an hour may come in ahead of a 100-miler. That is why we place speed after luck, endurance and driver's skill. A fast car lacking the

stamina which will carry it 500 miles, or 300 miles is not a contender. A fast car with the stamina, in the hands of an inexperienced driver, is not a contender. Our house-that-Jack-built progresses. The factors, so far outlined, are correlative, and a driver must tread on all of them, not on any one alone, to get in the money.

Races Without Accident Rare

A long race without an accident, harmless or fatal, is as rare as a hen in swimming. Although many minds have worked overtime devising safety appliances and building up scientific track curves and safety walls to keep the cars on the course, it is safe to say that about 25 per cent of the spectators of a big race come equipped with field glasses and an iron will pent on getting a close-up of the car that climbs the rail. A death puts a damper on the crowd and on the enthusiasm, but a thrilling clicking of hubs, or a desperate spurt onto a turn followed by a hair-raising skid and possible upset without fatal results, gives the man from Homeburg a conversational advantage which reserves a seat for him in the center of the corner grocery you-don-say-so ring which is good for many weeks. Upon what does freedom from accident depend? Luck, car endurance, driver's skill and car speed, say we.

Is it not a matter of luck if a driver happens to be closely following a car which blows a tire and turns over in his path? If he avoids crashing into the wreck it is luck combined with skill. If he hits it the fates are against him. Then too, is not the endurance of the car an element in the prevention of accident? He will not got in the ditch from a broken steering knuckle if that part is of the right design, size and material. Does car speed govern accident? If a car hits a turn at 100 miles an hour and the track is greasy that car may skid through the rail. If the car were only capable of going 95 miles per hour the skid might not carry it through the fence. Again, a burst of speed in a critical mixup of cars may pull the racer through to safety—one more brick in the house-that-Jack-built, or was it a frame building?

There is another mechanical factor in the racing business which can hardly be classed under the head of car endurance and that is tire trouble. Furthermore, we are putting it this far down in the list, both because of the fact that many winners of races have beat the others despite an unusual amount of tire trouble, and because tire trouble is directly dependent upon the other factors above outlined. Luck? Yes, of course. Car endurance? If your front wheels spring out of line the tires soon go. Driver's skill? Indeed, the systematic conservation of tires in a race is an art. Car speed? Take the extreme in comparison. A car traveling 1 mile an hour will go many miles further on a set of tires than a car traveling 100. There you are! Simple!

Driver's Endurance Uncanny

Let us insert one more element in the list and put it on the tail end because it has seldom had any important bearing on a big race. The endurance of a driver is uncanny. After mechanically legging it over a 500-mile merry-go-round at an average speed of close to 100 miles an hour, he stops at the pits, tears off his goggles, and—grins. How do they do it? How did a human being go over Niagara Falls in a barrel and come out kicking at the other end? It is one of those qualities of human nature which makes fodder for the newspapers and keeps the world going round. The driver's endurance is a thing to be praised, but not to worry over in the final results.

Thus we have a completed equation as simple as 2 plus 2 equals 4. Luck, plus car endurance, plus driving skill, plus high speed, plus freedom from accident, plus freedom from tire trouble, plus driver's endurance equals victory.

So much for the man that gets there first. How about the average speed figures that are going to appear on the score board to his credit? What determines the winner's speed? A chart has been prepared and appears on these pages, which purports to show the performances of drivers A, B and C, and we use, as the factors governing the final result in their relative order of importance, car speed, driver's skill, condition of track, number of stops at the pit, driver's endurance and luck.

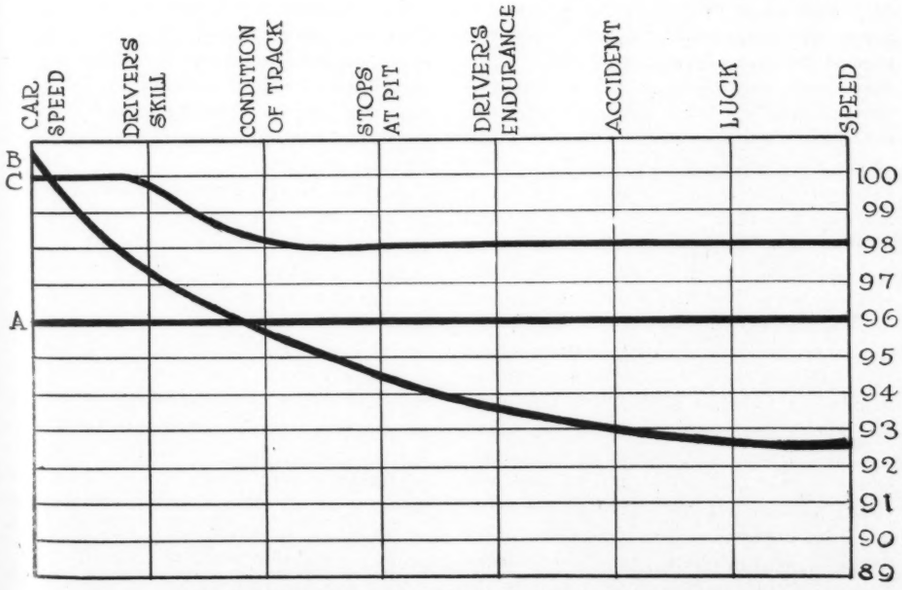
Poor Driver Has Small Chance

First take note of the performance of driver A. He is working under ideal conditions except for the one fact that his car is not capable of attaining a speed above 96 miles an hour. It is his one handicap. Is he going to win the race? Not if another driver with a much faster car surmounts enough of the obstacles in front of him to keep his average above 96 miles per hour. But is the speed of the car the feature upon which all others are governed?

Take the performance of driver B as the next example. He has a car that is capable of circling the track once at a speed above 100 miles an hour. The race starts. He is a poor driver and does not get out ahead. His inexperienced handling of the turns and dodging of other cars on the course brings down his speed average. Because of improper nursing of his car he is obliged to stop frequently at the pits; he begins to get discouraged and the nervousness taxes his endurance and takes his nerve; he may brush another car and loose a few seconds regaining his speed on the track; fate is against him. If he finishes at all, his average is low.

Driver C starts with a car which has, possibly in the elimination trials, demonstrated that it is capable of developing 100 miles an hour, or better. He is a veteran in the game, and through many years of failure and success, has learned the inside of racing. We allow for a track which is not in perfect condition, too hot for the tires, or possibly slippery, to reduce his speed. He must necessarily stop at the pits for occasional tire changes or fuel replenishment. His endurance has, through many battles, been brought to the strength of steel; he encounterers no accidents and is blessed with luck because he knows the secret hiding place of that quality. Driver C wins the race.

What does it all mean, anyway? Is it correct to assume that victory and highest average speed is governed by a fixed rule, or is it a gambling game with the driver playing his hand with the backs of the cards up? Try to dope the winner of Tuesday's race, and his average speed, and then compare your dope sheet with the final results. If you dope it correctly it is luck—you have found the lair of the goddess of chance.



WHY SPEED ALONE DOES NOT MAKE A WINNER

A—Slow car driven under ideal conditions. B—Fast car piloted by inexperienced driver. C—Fast car in hands of veteran driver

Conquerers of Distance—the Engineers

Intimate Biographies of the Men Who Have Made Possible Present Racing Cars and Speed Records

WHO among the racing fans and railbirds has not wished for some intimate knowledge of the life and experiences of the men who are responsible for present design of racing cars? As they sit in the stands or walk around the paddock, watching intently the struggle for honors among drivers, do they forget that the men in whose brains the mounts had their inception, deserve equal honors with the driver in taking the stellar honors? The engineer and designer might be likened to the playright on the night when the child of his pen is being held up to old man General Public for criticism or plaudits.

With the thought in mind that many persons would like brief descriptions of the work done by the engineers and designers of the cars to be seen in this year's races, these have been procured and will be found, together with illustrations, herewith:

Ernest Henry

Peugeot Designer

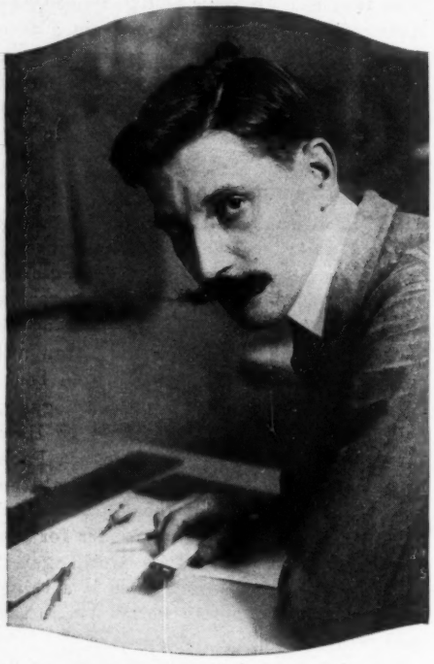
IN Europe racing car designers get so little of the limelight that probably not more than a mere handful of persons in the trade know that Engineer Henry stands at the back of the successful Peugeot racers. Race drivers are popular idols and get so much publicity that some manufacturers have asked themselves whether they were in the game for the benefit of the car or the man who drove it; the engineer gets his monthly wages, and goes home satisfied.

Ernest Henry joined the Peugeot combination in 1911 and prepared the cars which won the French Grand Prix at Dieppe in 1912. He was born in Switzerland 31 years ago and got his early training among the select and highly-skilled Swiss engineers who have had a greater influence on motor car design than is generally suspected. About 1906 Henry was attached to the Megevet firm in Geneva, for whom he designed high-speed racing motors to be put in boats run at the annual Monaco meets. Monaco, with its limited cylinder area rules, did a lot to develop the present type of high-efficiency engine, and the engines designed by Henry in 1906 had many features which became common practice only half a dozen years later.

Designed Aviation Engines

In 1908 Henry was attracted to the French capital and became connected with the Labor Co., for whom he designed aviation engines very similar to those used in boats. Although his engines had not been designed with a view to low specific weight, they really became lightweight engines by reason of their high volumetric efficiency. Henry was a partisan of the long-stroke school, the dimensions of some of his Labor engines being 100 by 210; he made an extensive use of ball bearings as far back as 1906, he studied multiple valves and got reciprocating parts down to very low measures.

When Henry was invited to Peugeot, he formed a partnership with Georges Boillot and the late Paul Zuccarelli. It was the finest racing combination the world has ever seen or is ever likely to see, and it alone was responsible for the wonderful success Peugeot enjoyed for 3 years. These three men were independent of the factory; indeed the main Peugeot factory at the outset despised them, and not a few of the older members of the staff predicted failure for the three charlatans. The racing men had their own drawing office and erecting shop attached to the Peugeot repair depot near Paris, but all their machining was done in outside shops, not even a bolt coming from the Peugeot factory. It was not an easy matter to get this independence, but after several determined stands the three were left alone and allowed to work out their own plans.



Ernest Henry, who designed the Peugeot

Ernest Henry was undoubtedly a clever engineer who had specialized in high efficiency motors. It was because the work he had done for Megevet and Labor fitted in so well with the French Grand Prix rules that he was invited to join the Peugeot team. He did not claim to know much about chassis, and his road experience was limited. Georges Boillot had spent several profitable years on the road tuning up and racing small Peugeot cars. He was not a trained engineer, but he had learned enough to appreciate a good car and to have ideas of his own as to what constituted a good car. Furthermore, he was a first-class driver. Zuccarelli had been in the Hispano-Suiza racing department and had been subjected to Hispano-Suiza influence. He was not a brilliant driver, but he was prolific in ideas.

No man predominated on this team. The engineer was not sufficiently powerful to force his theory down the throats of the drivers, and the drivers were not likely to waste time over ideas which they considered practical but were wrong in theory. Each man put his own ideas into the common fund; and even the mechanics could bring ideas knowing that they would not be turned down with disdain by the engineers. As Boillot proved a good general manager, the making of the parts in various outside shops did not prove a drawback; the quality of the work done in these small shops is of the very best.

A Creditable Showing

The Henry, Boillot, Zuccarelli team got its justification when it won the French Grand Prix in 1912. It defeated Fiat, whose cars and methods were everything that Peugeot was not. Fiat had cars of twice the cylinder capacity of the Peugeots; they had been built throughout in the Fiat shops by clever engineers with a brilliant record behind them, who would have disdained to receive any suggestions from a mere race driver. When the cars were completed and handed over to the Fiat race drivers those cars were perfect—no suggestions from the drivers were either asked for or accepted. Yet three men, not one of whom held an official engineering diploma, roundly defeated Fiat at their own game.

In 1913 Henry produced another set of racing cars with detail improvements as the result of lessons learned at Dieppe. Again the French Grand Prix was won and a score of minor records were hung up. For 1914 another set of cars was produced under the same conditions as during the two previous years. The French Grand Prix was lost owing to the breakage of a valve on the last lap. The war interfered with further racing, but before the racing department closed down Henry had produced a set of 152-cubic inch cars capable of 95 miles an hour; they will doubtless prove a sensation when the war is over.

The war was responsible for the dismemberment of the Peugeot team. Engineer Henry now is occupied in producing for

the French government the Henry eight-cylinder aviation motors of the same general design as the engines he used for racing on road and track, and Boillot and the other drivers are at the front.

Delage and Michelat

Designers of Delage

WHEN Louis Delage came out of the Arts et Metiers Technical School, at Angers, about 22 years ago, with a mechanical engineer's diploma in his pocket, his intention was to get into the motor industry and eventually become a motor car manufacturer, but he was also under the healthy necessity of earning a living, and that necessity was so persistent that for 10 years he merely kept an eye on the motor car while working in various engineering shops. In 1900 he refused to be kept out of the industry any longer, and throwing up a substantial job in a general engineering shop, he entered a motor factory as an ordinary draftsman. He had merely stepped down to get a better start, for towards the end of 1903 he was invited to become chief engineer of the research and experimental department of the great Peugeot factory.

To his friends and relatives this looked like the high road to success and fortune, but Louis Delage had bigger ideas than holding down a job in the Peugeot shops, and after 2½ years he resigned to form the Delage Automobile Co. His friends unanimously told him he was crazy, but that did not cause Delage to lose any sleep. He was painfully aware of the diminutiveness of his six-thousand-dollar capital, and he never thought of asking the news agencies to take a picture of his factory staff. When the dinner bell sounded, six men used to emerge from that little shop at Levallois, just outside Paris. The six comprised the boss and Engineer Le Gros—now works manager of the big Delage factory—who had also been induced to abandon Peugeot.

Delage started business with a firm conviction of the value of racing, both as a business-getter and as an improver of the breed of motor cars. He was primarily interested in the production of small, light cars, generally known as voiturettes, as if their makers were too modest to put them in the same category as the heavy, powerful cars of the big factories, and for which wealthy Americans were then willing to pay fancy prices. But Delage raced with voiturettes—noisy one-lungers which always impressed the public by getting there. He raced with the type of car he manufactured, and only got into the big racing car class after going right through the voiturette and light car schools.

In racing circles the story is told that Delage race drivers never change a spark plug without first of all sending a cable to Louis Delage. This is one of those half truths which only serve to reveal the man's character. When Louis Delage is in for a race, there is nothing in connection with the race, or in the cars he is

Louis Delage and M. Michelat, engineer of the Delage

building for the event, of which he is ignorant, but he is too faithful to his own motto, "Do only one thing, but do it well," to want to do everything with his own hands. One of the secrets of his success lies in so arranging matters that every one of his assistants works under the best possible conditions and to the best advantage.

Thus, since the six-man factory has grown to be one of the biggest in France, Delage has entrusted the actual designing of his racing cars to his brilliant chief engineer, Michelat, who also received his training at the Arts et Metiers Technical Schools at Angers. Michelat joined the firm in 1910 and has designed all the racing cars since, including the 1913 French Grand Prix winners which carried off the Indianapolis first prize in 1914. There is a happy co-operation which does not appear in any other French factory. While Michelat is entrusted with all the details of design, Delage is in constant consultation with him and the entire factory stands at the back of the racing cars. Everything in connection with the racers is made in the Delage shops and every departmental head does his best to make the machines a success. The greatest reward a mechanic can have is to be transferred from the main to the racing and experimental shops. The maintenance of this spirit among the staff is due to the genius of Louis Delage, and it is a factor which has helped him to win nearly all the races for which he has entered.

Louis Coatalen, chief engineer of the Sunbeam

Heinrich Haeder

Designer of the Mercedes

HEINRICH HAEDER is the German engineer responsible for the Mercedes racing cars which captured the last French Grand Prix, and also for the machine which now is being campaigned in America by Ralph de Palma. Haeder is a clever engineer who received his preliminary training in the technical schools of Stuttgart. His brother, Herman Haeder, is a well-known technician, and the author of the most authoritative book on the construction of gas engines. It was about 12 years ago that Heinrich Haeder entered the Mercedes factory at Unterturkheim, his position then being that of an ordinary draughtsman. He soon showed his merit and was put in charge of the experimental department.

In this position he not only designed all the racing motors, but was responsible for all the new aviation engines. It is obvious, from a mere examination of the Mercedes product, that the racing car and the aviation sections have always been under the same control, the lessons learned with one type serving for the improvement of the other. Haeder's latest production is the six-cylinder Mercedes aviation motor of 5.5 by 6.29 inches bore and stroke, which gives 178 horsepower at 1,450 revolutions per minute.

In his road racing work Haeder, of recent years, has been seconded by the young engineer Seiler, who made such a sensational debut as a race driver in the last French Grand Prix, where he broke the lap record and led the field until he overturned.

Louis Coatalen

Designer of the Sunbeam

ALTHOUGH one of the most prominent members of the British motor industry, Louis Coatalen, chief engineer of the Sunbeam Motor Car Co., still owes allegiance to France. Coatalen first saw the light in a small town of Brittany, France, and received his technical education in the Paris engineering schools. After holding various jobs as draftsman and engineer in the French motor shops, Coatalen, while still in his twenties, thought he saw better prospects across the Channel. He held

an unimportant job with the Humber Co., at Coventry, and later gained experience, if not much wealth, with the Hillman-Coatalen Co.

His chance came when, about 10 years ago, he was invited to become chief engineer of the Sunbeam Motor Car Co. At that time the Sunbeam was almost submerged under a cloud and it did not cost

Finley Robertson Porter, engineer of the F. R. P. cars

the directors much to give Coatalen a big slice of stock, but the little Frenchman had no sooner got hold than he began to make things hum. Britishers, who are generally slow to make up their minds, began to realize that the car built at Wolverhampton was better than most, and year after year that opinion became more firmly established. Now Sunbeam stock, which 10 years ago was given away so generously, stands higher than that of any motor company in Europe, and Louis Coatalen's fortune has increased with that of his company.

Even before he got into the Sunbeam company, Louis Coatalen had the racing craze. He is one of those quiet-spoken, unassuming men you would expect to be quite satisfied to meander along at a sober 20 miles an hour, leaving it to others to kick up the dust of 90 miles an hour. But on whatever subject you start conversing with Louis Coatalen you invariably get round to racing and racing cars. When Brooklands was built he was the first to be on the spot, and his cars have been the most consistent performers on the English speedway. If there is a race anywhere in Europe, you can be sure that Louis Coatalen and a team of Sunbeam cars will be there —and the other fellows will know it, too. It is not advisable to mention in Louis Coatalen's presence that racing does not pay. He would not argue with you, but would be apt to regard you in as pitying a manner as the British sea captain looks upon the persons who suggest the Lusitania went down through an internal explosion.

Although Coatalen can claim to be "Boss of Brooklands," he got his greatest personal satisfaction in 1912, when he won the 3-litre class of the French Grand Prix at Dieppe.

Finley R. Porter

Builder of F. R. P. Cars

PRIOR to 1904 Finley Robertson Porter followed hydraulic and steam engineering, and from 1904 to 1909, he did experimental work on steam motors for motor cars and aeroplanes and on gasoline engines. During this period he took out some ten or fifteen basic patents on aeroplanes, steam engines and kerosene burners.

From 1910 to 1914 he was chief engineer of the Mercer Automobile Co., during which period he designed and built the 300 cubic inch T-head motor, types M and F, which were defeated only once in 2 years and captured all 300-cubic inch road records in existence at that time.

During 1913 and 1914 he designed and built the model 45, Mercer's 450 cubic inch motors and cars that won second in the Vanderbilt Cup race in 1914, and first in the grand prize, establishing a new world's road record. Since that time Eddie Pullen has established a new road record at Corona, and won practically all the important events in the West with this same motor, in fact, has done all of the winning that has been done by the Mercer company since that time.

From 1914 to the present time he has been operating his own company, and has produced a 450 cubic inch, valve-in-the-head motor that develops 170 horsepower at 2,500 r. p. m. and has shown speed of 118 miles an hour in a two-passenger chassis.

Ray Harroun

Designer of Maxwells

FROM filling teeth to building racing cars is the gamut run by Ray Harroun, who drove the Marmon Wasp to victory in the first race at Indianapolis, and whose mechanical genius is exemplified in the Maxwell, this racing stable having been in his charge up to the time the Maxwell Motor Co., withdrew from racing last year.

Harroun got his technical education by private instruction from an Annapolis graduate, taking up mechanics outside of his regular school hours at Meadville, Pa. Like a great many others who study for some profession, Harroun did not find his chosen field of endeavor with many holes in it when he wanted to apply his knowledge to the actual engineering problems he felt confident he could master. Instead he found that his services could be marketed in a Chicago dental establishment, and, since he knew dentistry, he treated, filled or pulled the aching molars in the interim. However, his chosen forte called too strongly for him to resist and he gave up denistry to do some demonstrating and professional driving in and around Chicago.

In 1907 he built a light, eight-cylinder racing car which did a mile in 31 seconds on the Daytona-Ormond beach course. Later he went with the Marmon company on a contract basis to develop a fast stock car for competition, in which he was eminently successful.

Next Harroun brought out a kerosene carbureter and drove a Henderson car across the continent while using one of these carbureters, and this carbureter has since been used on the Maxwell racers. Hughie Hughes won the Potlatch trophy at Tacoma, Wash., July 3, 1914, a 200-mile event, at over 74 miles per hour while using the Harroun kerosene carbureter.

Harroun's last engineering work was as chief engineer with the Maxwell Motor Co., during which time he brought the Maxwell cars up to a high stage of efficiency. In future he intends to specialize on motors only, and it is his ambition to develop a thoroughly reliable commercial that, to use his own words, "will operate on any old fuel from butter to gasoline and let the fuel makers fight it out among themselves without inconveniencing either the public or the manufacturers of cars."

E. H. Delling

Mercer Designer

AFTER working four and one-half years as apprentice, tool maker, motor assembler and road tester in various factories in Germany, E. H. Delling graduated as a mechanical engineer from the College of Technology of Charlottenburg, Germany. He then worked for a number of years in

Ray Harroun, who designed the Maxwells

various European motor car factories. In the fall of 1907 he came to this country in order to study quantity production. Originally, it was his intention to stay here only for a short while. However, he soon realized the chances which this country offers to engineers, and, outside of a few trips to Great Britain and Continental Europe, he has stayed here ever since.

At the Mercer factory he developed the Mercer, "F" 301 cubic inch, type F motor, which was piloted by Hughie Hughes during 1912, finishing third in the 500-mile race at Indianapolis, winning the Aurora trophy and finishing second in the Vanderbilt Cup race at Milwaukee In 1912 this model finished second in the 500-mile race at Indianapolis and won the Chicago Automobile Club trophy. Subsequently, he left the Mercer company, and this motor was redesigned by Mr. Porter for 450 cubic inch piston displacement, three cars of this type being built.

A. E. Milbrath

Designer of Wisconsin Engine

A. F. MILBRATH was born and educated in Milwaukee, Wis., and received his technical training in a private engineering school in Milwaukee. He started with the C. J. Smith & Son Co., now the A. O. Smith Co., Milwaukee, in 1895, as draftsman. In 1897 he became chief draftsman for this company, which position was held until 1907.

In the early part of 1907 an offer was made by the McLaughlin Carriage Co., Oshawa, Ont., Canada, to take charge of its motor car department. This offer was accepted and that position was held for about 6 months when sickness necessitated giving up this work. After recovering, the Wisconsin Motor Mfg. Co. was started in Milwaukee in March, 1909, with Charles H. John as president and treasurer and A. F. Milbrath, secretary and engineer, and these positions are still held at the present time, the company having grown steadily ever since its origin.

A. F. Milbrath is the designer of all of the Wisconsin engines and the company now builds a great many sizes from a four-cylinder 3¼ by 5 to an eight-cylinder 5¾ by 7. These engines are built for all purposes, such as motor cars, trucks, tractors, boats, portable, stationary plants, railways, irrigating pumps, racing cars, aeroplanes, etc. Mr. Milbrath also designed the motors which, in the Stutz cars in 1915, won first and second places in the Elgin road race, Chicago Automobile Club Trophy Race, Twin City speedway, 500-mile race, and the 350-mile Sheepshead Bay race.

A. E. Milbrath, engineer who designs Wisconsin motors

Louis Chevrolet, designer and race driver

Fred S. Duesenberg

Designer of Duesenberg Motor

THE name of Duesenberg and racing have been synonymous in the last few years, for a number of cars besides those bearing that name have used and are using Duesenberg motors. Alley's Ogren, Billy Chandler's Crawfords and the Omar, besides some others are equipped with the Duesenberg type of motor. Fred S. Duesenberg, the designer, at the age of 17 was working in an implement store, forsaking this 3 years later to open a retail bicycle store, besides doing some bicycle racing.

In 1903 he became tester for the Thomas B. Jeffery Co., Kenosha, Wis., and in 1904 built the first two Mason cars—two-cylinder jobs—and had charge of the designing and building of the Mason until 1910, when the present type of eight-valve Duesenberg motor was brought out. In January, 1911, Mr. Duesenberg went to Des Moines and distributed several well-known makes of cars, making the Duesenberg motor as a side line until the demand became such in 1914 that he had to devote all his time to motor production. He organized the Duesenberg Motor Co., at St. Paul, Minn., but a serious illness in 1914 prevented much progress with new designs. However, since his recovery he has perfected a sixteen-valve type of motor and now is building powerplants for motor cars, aeroplanes and marine purposes.

Louis Chevrolet

Designer and Race Driver

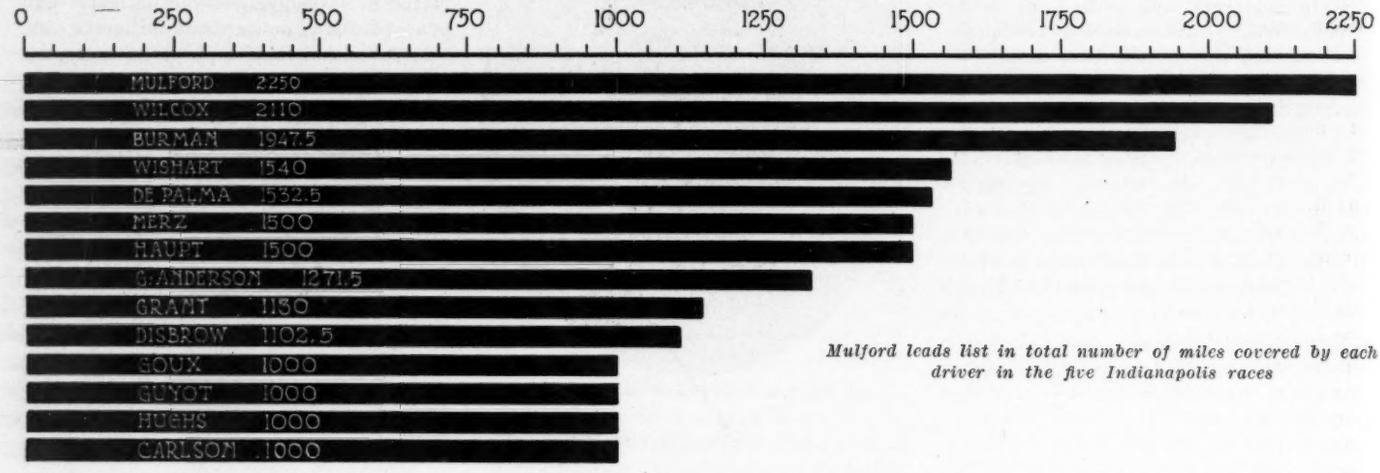
LOUIS CHEVROLET probably has been connected with the motor industry longer than any other driver-engineer in this country. As far back as 1898 he was associated with the Mors and Darracq cars in France. He came to America in 1900 and worked for De Dion Bouton Motorette in Brooklyn, leaving there in 1902 and drifting about until he began racing Fiats in 1905. He quit racing for a while in 1908 and then went back for the Madison company. In 1909 he joined the Buick and designed, built and raced Buick cars in 1910, driving his Buick child all over this country.

When the Buick quit racing in 1911 he started the Chevrolet Motor Co., continuing until the fall of 1913 when he began experimental work and kept at this until last year when he started the Frontenac Motor Co., for the exclusive manufacture of racing cars. He has been entered in an occasional race during the last few years and is expected to be a contender at Indianapolis next Tuesday, since three Frontenacs, one to be driven by himself and two others by his two brothers, are entered for the Memorial Day race.

F. S. Duesenberg, who designs the Duesenberg motor

Can You Judge the Winner of Indianapolis by His Past?

Statistical Evidence of What Has Been Done May Govern 1916 Race Dope



Mulford leads list in total number of miles covered by each driver in the five Indianapolis races

UPON a basis of percentages computed from the success he has had in swinging a stick of wood at the opportune moment to meet a leather-covered sphere, hurled swiftly, and often undulatingly, in his general direction, the contact of the two causing the sphere to fly through the air to alight in a spot not within the immediate reach of a scattered group of nine men pent on stopping its flight, a man named Tyrus Cobb has established for himself a reputation as the premier batsman of baseball. He has gained this reputation through yearly consistency; has ironed out his faults until now he can be relied upon to maintain a more or less constant average each month and each year.

Mulford Has Big Mileage Total

Is not such a law of average comparable in motor car racing, both when applied to the drivers and to the different makes of cars? Does the element of chance bear more heavily on motor car racing than on baseball? Does the mechanical feature offset the percentage of accuracy which is brought about by human feats alone? Such questions can be better answered when enough years have passed to allow longer percentage tables than are now available, but comparative figures gained from the four years of racing on the Indianapolis speedway are interesting for their possibilities in this respect. What will the results of Tuesday's classic divulge?

In a matter of total mileage per driver in the five races, Ralph Mulford stands at the head of the list with a sum of 2,250 miles out of a possible 2,500. In 1915 only, did to fail to finish.

To date he is batting .888. Wilcox, always a strong contender, comes second in the list with 2,116-mile total. Entered in each race, he failed to finish twice, first in 1911 when he was out at 450 miles, and last in 1914 when he only succeeded in piling up 160 miles before misfortune overtook him.

Burman Learns a Lesson

The late Bob Burman is the last man in the list who competed in all five races, and he went the entire trip but once, that in 1915, when he finished sixth. Has it not been said that it took Burman several years and many bitter experiences to learn the value of humoring his car in long grinds? His last showing at Indianapolis proved his learning.

Of the five winners, Harroun, Dawson, Goux, Thomas and De Palma, none competed in all five races. De Palma came to the tape in 1911, 1912, 1913 and 1915; Goux in 1913 and 1914; Dawson in 1912 and 1914, and Harroun and Thomas in the races which they won.

Still another angle is gained from a comparison of the average speed of drivers who have finished in the money in two or more of the events. De Palma leads with an average, for two races of 80.48 miles per hour, with Goux next in line at 77.66 miles per hour. Following is a comparative table:

Driver	No. of races	Average speed
De Palma	2	80.48
Goux	2	77.66
Guyot	2	75.56
Dawson	3	75.52
Carlson	2	74.96
Merz	3	73.25
Wishart	2	73.07
Mulford	3	65.81

Three drivers—Dawson, Merz and Mulford—finished within the money in three out of the five races. Mulford started in each race, Dawson in four and Merz in three.

It is a peculiar fact that the leading cars and leading drivers in each table are the cars or drivers which either pulled down the money at Indianapolis or established enviable reputations for themselves on other tracks and road courses since the time this particular speedway has been in existence.

Is not Indianapolis a standard? Is not the result of this particular event a prophesy of what is to follow in the ensuing races of the year? Furthermore, is it a matter of car or of driver which establishes the rule of consistency? Mulford used a Lozier, a Knox and a Mercedes in his three finishes; Merz a National and a Stutz; Dawson a Marmon and a National; de Palma a Simplex and a Mercedes; Guyot a Sunbeam and Delage; Wishart a Mercedes and a Mercer.

If it were possible for each driver to return to the Indianapolis track each year, the averages would develop a Ty Cobb of motor car racing, but as the matter stands the Indianapolis championship honors must be divided among a half score of the old-timers who have come back and nosed into the cash prizes each year.

Comparative Speeds

A curve of comparative speeds of the five winners is shown in the accompanying diagram. The curve, as a unit, reminds the writer of the effect on engine acceleration in shifting from second to high gear. From 1911 to 1912 there is a speed rise from 74.59 miles per hour to 78.7 miles per hour. Then the clutch is released—might we call the drivers the tension springs?—and 1913 starts the pickup in high which makes a constant acceleration for 3 years.

Why is not that equal increase—acceleration—in average winner's speed a prophesy of what is to come this year? The distance is shorter. Cannot we expect an average speed of 96 miles per hour, which is the approximate figure reached by extending, in a straight line, the curve for 1913, 1914 and 1915? Note the consistency of this deduction from the accompanying chart, and then, after the race draw in the 1915-1916 line from the final results. It is the writer's opinion that it will be but slightly curved.

At first glance, due to the fact that the distance this year will be but three-fifths that of the previous events, one would say that the curve should bend upward to a speed above 96 miles per hour. Here, however, must be inserted the element of the maximum speed possibilities of the track. Are the curves of such grade that speed above 98 miles per hour is possible? The record for the track for one lap is 98.9, made last year by Wilcox in a Stutz. It seems a fallacy to assume that such a speed could be maintained for 300 miles.

Foreign cars have been victorious in the Indianapolis races for the last 3 years. Only in 1911 and 1912 did American-made cars take top place. Although, in every race, the American entries were far in excess of the foreign, it is interesting to note that in one event at least, the 1913 contest, foreign cars took six places in the prize money while American cars got but four. Out of a total of fifty prize winners for the five years, cars from across the water took seventeen places, while the remainder, of thirty-three purses, was kept in this country.

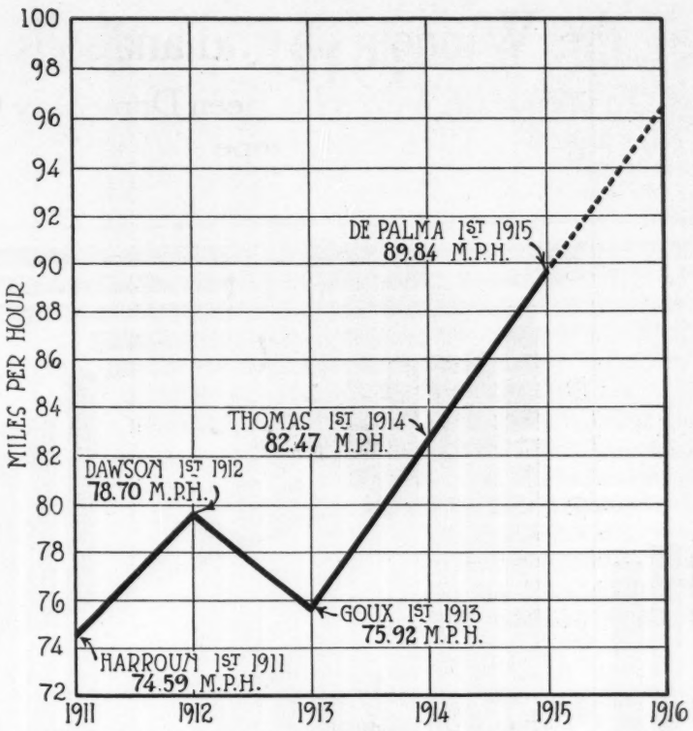


Chart of winners' speeds shows constant increase in last 3 years. Complete the chart after Tuesday's race

A like comparison of the performances of various cars is interesting in that the makes which have gone the greatest number of miles at Indianapolis have, in very direct proportion, made the most creditable showing in other road and speedway events, particularly in 1915. The Stutz team, in the 1915 event, created a sensation for the consistency of its team work. Was it a development or improvement in the cars or drivers which, in races later in the year, put the Stutz at the top of the list for consistent performance? The aggregate mileage of all Stutz cars to participate at Indianapolis is 5,564. Second comes the Mercedes with a total of 3,235 miles. It was a Mercedes that carried de Palma over the tape first in 1915. The Peugeot is third. Jules Goux won in a Peugeot, and Dario Resta pressed de Palma for a thrilling second in the same make of car in 1915.

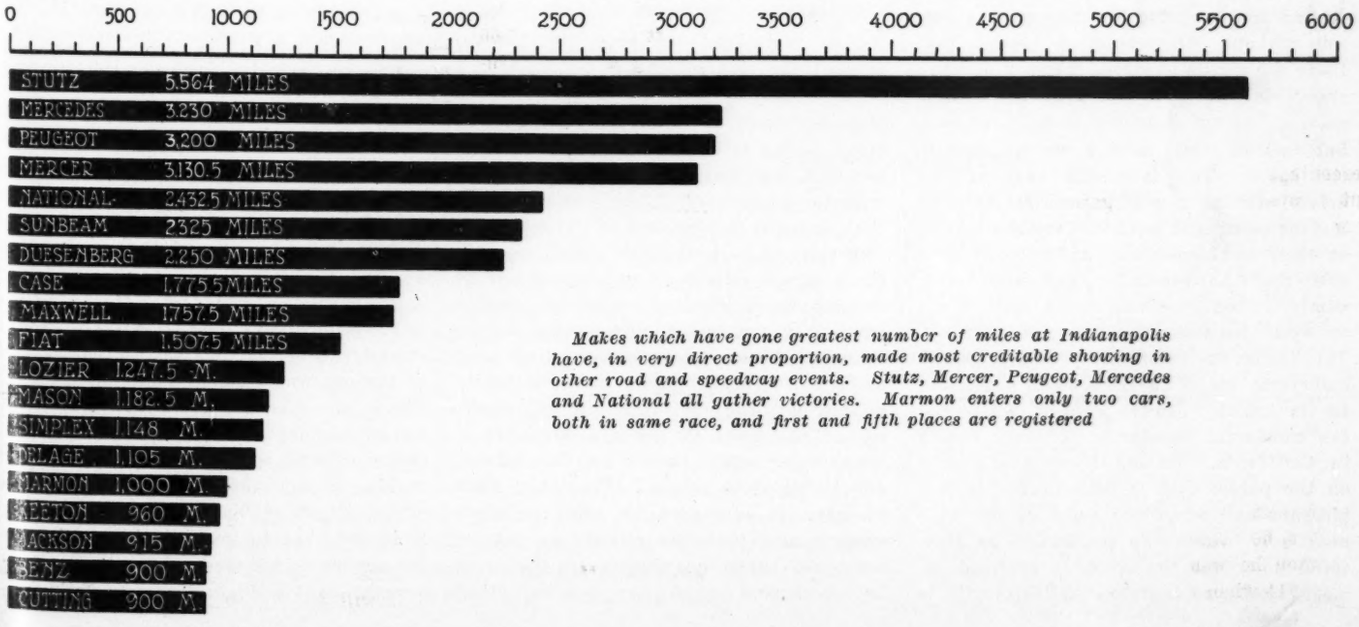
The Mercer, with 3,130 miles to its credit, got twelfth in 1911, third in 1912, second in 1913, failed to place in 1914, and had no entries in the last race. Away from Indianapolis, however, it carried off a score of victories, especially in road racing. The National, fourth in the list with 2,532 miles, was Dawson's winning mount in 1912.

The rest of the list is not so representative of the cars' performances, but goes to show the number of makes which have gone the route. Marmon, which carried Harroun to victory in the inaugural event, has entered but two cars in the 500-mile races, both in 1911, and first and fifth places were registered. Of the first ten cars in the table, four of them, Mercedes, Peugeot, Sunbeam and Fiat, are foreign made. This is a remarkable proof of consistency in performance of the imported mounts, inasmuch as the totals are swelled in several instances by the same cars being used in 2 successive years.

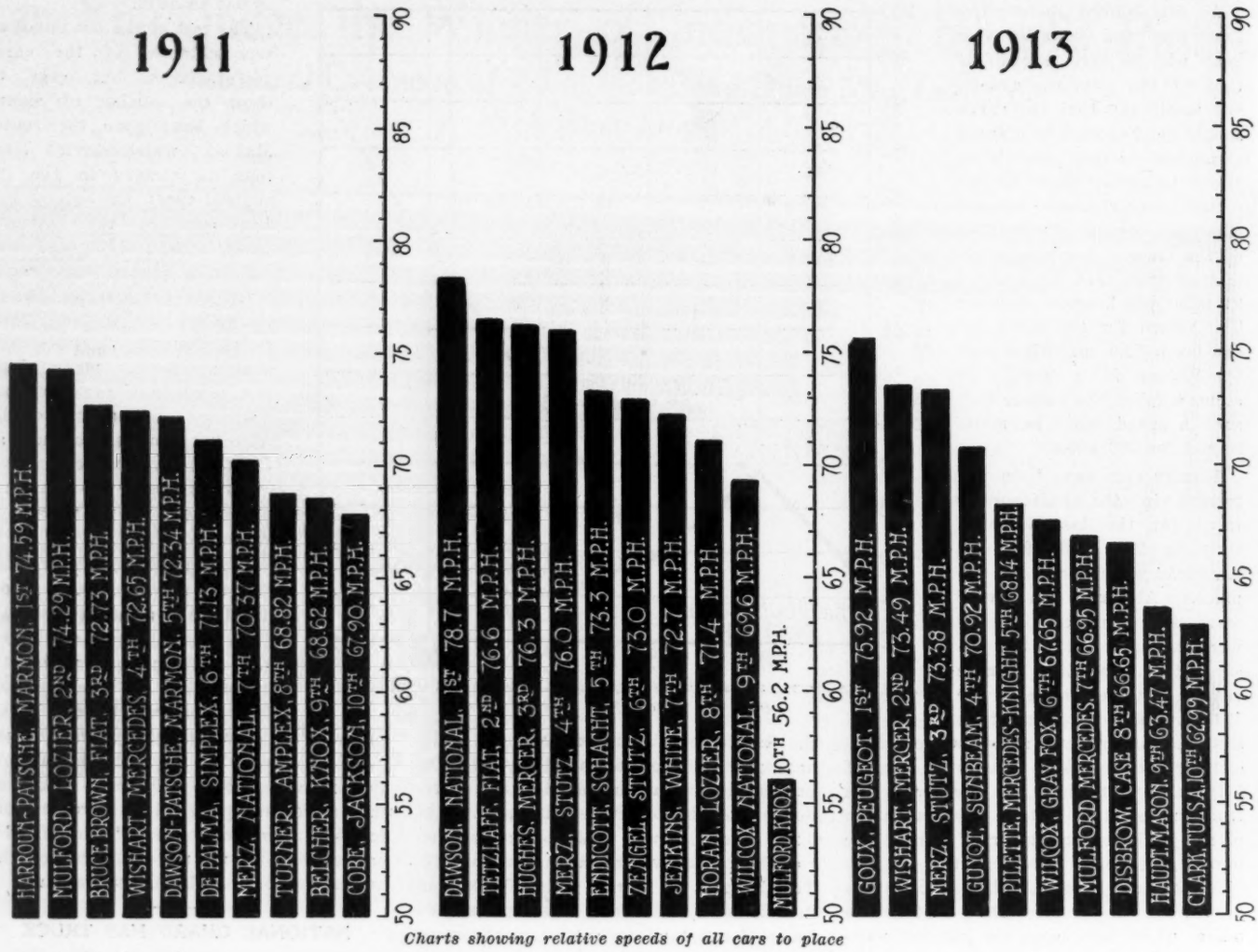
If Ralph Mulford crowds his Peugeot to victory next Tuesday he will create an average of year-in-and-year-out plugging that can be excelled by no one. If he places in the money he will be the W. J. Bryan of Indianapolis, always in the running, but never on top. Merz and his Peugeot also line up well for a chance at the consistency prize. It is a regrettable fact that there are not more "Old School" entries to pile up more figures for the amusement of the chronic statistician.

NATIONAL GUARD HAS TRUCK

Los Angeles, Cal., May 19—When Battery A, First Field Artillery, N. G. C., is called into active service, which is expected at any time, a fully equipped Moreland motor truck will be carried as a part of the equipment of that organization, according to Capt. Jesse McComas, commanding officer. The truck is the gift of Manager Watt L. Moreland,



Makes which have gone greatest number of miles at Indianapolis have, in very direct proportion, made most creditable showing in other road and speedway events. Stutz, Mercer, Peugeot, Mercedes and National all gather victories. Marmon enters only two cars, both in same race, and first and fifth places are registered



Charts showing relative speeds of all cars to place

What Should Be Done to Benefit Racing

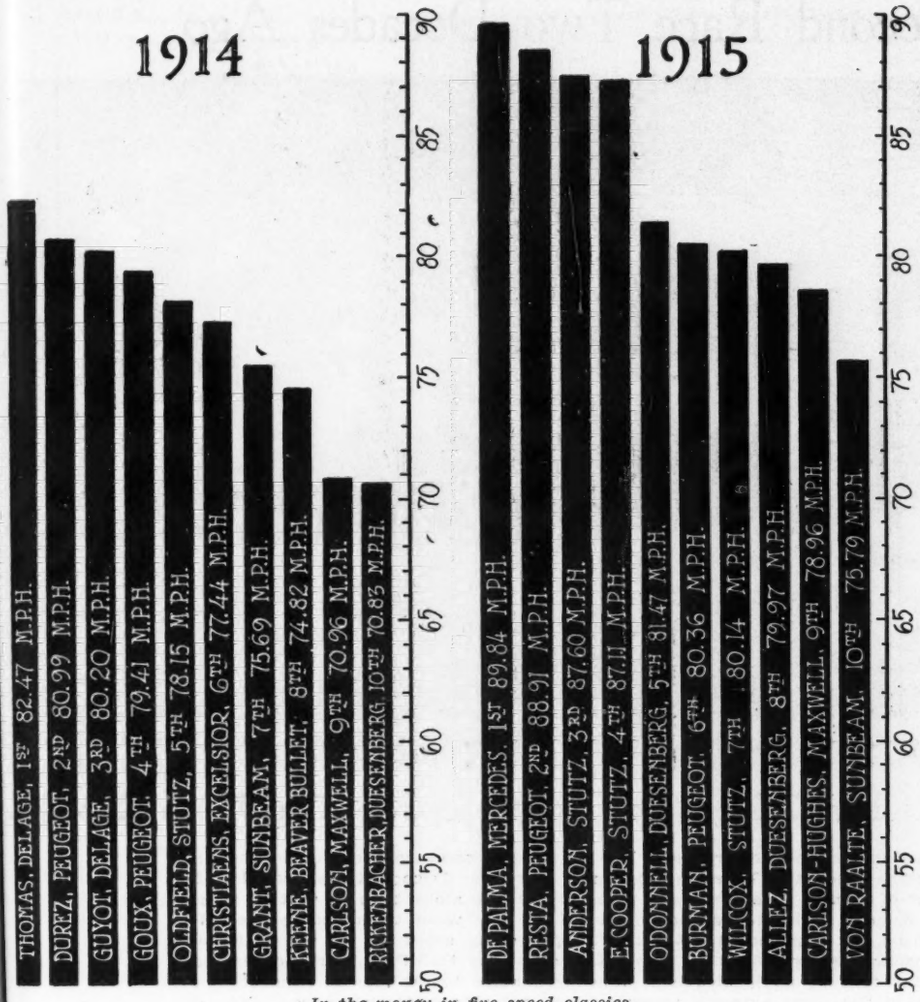
Maxwell Driver Gives His Version of Some Improvement That Should Be Considered

By E. V. Rickenbacher

ONE can hardly approach the subject of motor racing for the coming season without experiencing a feeling that there are thrills in store. From a driver's standpoint, the strenuous progress outlined presents many obstacles to be overcome, but this in itself adds a certain zest to the sport. The fans will hear of one driver winning a grueling contest at some distant point and see him face the starter at their local speedway a few days later and that hard-to-define condition commonly called personal touch will begin to exist between the fans and drivers. This latter condition has passed from the embryonic stage on the Pacific coast and to its healthy growth can be attributed the wonderful popularity of motor racing in California. Racing there has a grip on the public that is both profitable and pleasant and when you consider the wide area over which the population is scattered and that the sport is confined almost wholly to southern California, it is indeed remarkable to note the general support the pastime enjoys.

The condition that exists in California may be made to exist anywhere where clean racing is conducted in such a manner that the fans will be wholly in touch with the prowess of drivers and cars, and that really is the keynote of the situation. Everyone who sits through a race, whether the program calls for one long contest or several short events, wants to realize what they are seeing, and having no set criterion to draw conclusions from and perhaps venture opinions upon, naturally do not get the real fun and enjoyment out of the sport that would be theirs if they were better posted on the drivers and the sport in general. That they want to learn is evidenced by their generous support and that the powers in control have not taken cognizance of this may be overlooked when you consider that racing is in a way a rather young pastime, but it is to be hoped that this end of the sport's welfare will receive more attention, and that before the public's enthusiasm begins to wane.

Heretofore it has received its stories and sidelights from the manufacturers' standpoint and as that standpoint would naturally be flavored with whatever the manufacturer wished to impress upon the reader concerning the sterling qualities of his car, the driver was in a great many cases hardly referred to. This kind of information grew tiresome with the usual stereotyped car predominating feature and as the car was manned by a living being whose life was the forfeit in case of a serious accident the public read, yawned and wondered what sort of a being this dashing person was and when they would be privileged to read something of him. It is not hard to imagine this feeling of the reader's part and when the sport is brought to his door he responds by at-



In the money in five speed classics

tending in person and then when the information that he has set out to seek personally is nowhere to be found, he is likely to feel that after all it isn't such a great sport and may be heard to remark as he leaves the speedway, "Yes, the Peugeot won; I wonder who drove it?"

This is, in a way, a commercial suggestion to get together, but we must not lose track of the fact that the public foots the bills and that the time to insure the payment of these bills, if we are ever going to put motor racing upon a firm footing as one of the big national sports, this coming season will have a great deal to do with it and calls for the extension of every courtesy to the fans.

It has been the prevailing idea that the foreign cars and drivers have had the call and this has had a dampening effect on the patriotic feeling that otherwise would be more in evidence by the American fan. Season after season he went with the hope that American brains and daring would win. Last season he had this wish granted and it was no one-sided victory, for it was won over Europe's best cars. It is also true that the foreign cars that invaded our speedways had class and speed and were driven by wonderful drivers. The opposition given them by American drivers was the most commendable considering their slower cars. This condition does not exist today, for American engineers have made wonderful strides and the drivers who were forced to do the best with what they had now have as good and in many instances better cars than their foreign competitors. This fact alone has given impetus to the fans' enthusiasm and his patriotic spirit has manifested itself, which is the spirit we must nurse.

As I have said before, there is sufficient evidence to believe that all the fan wants is a little schooling in the sport and along with this it is also our duty to look after his physical comfort while attending the races. The transportation question the last season could be greatly improved upon. One wonders how so important a question could have been overlooked, especially when you consider the enormous amount of capital invested—in some instances it represents a million or more—and the only way this investment can be made to pay is through attendance. The motor owners seem the favored ones, but we must not lose track of the fact that not all the fans enjoy ownership of cars and to them the tales of miles to walk after leaving the street car are discouraging and are sometimes the deciding factor that keeps them away.

Out of a total of nine prominent speedways, last season found only four with adequate transportation facilities. This average of less than 50 per cent marks it as not confined to any certain locality and causes those interested in the welfare of the sport to protest; and we hope that the reasons given are sufficient to cause improvement. Then we have the out-of-town visitor to look after. It has been said that the true car fan counts his expense after the race is over. However true this may be, our friends from out of town have been put to more or less expense by their railroad fares, and then to add to this his hotel bill in a magnified state is not going to meet with his fullest approval. This latter increased hotel rate nuisance should be adjusted by the promoters and hotel keepers in a way which would prove satisfactory to all parties concerned.

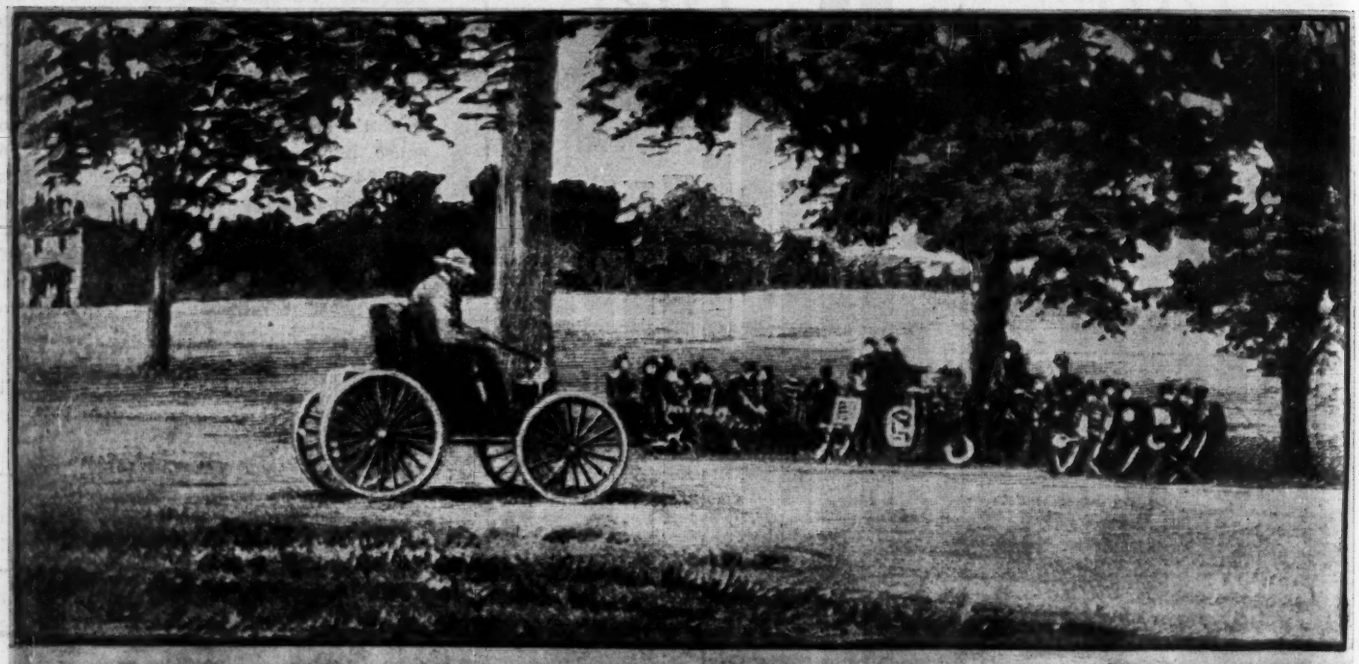
I personally have recollection of rates being increased over 200 per cent and have wondered why, when in most cases there was sufficient room for all, that these same business men could not see that this influx of people was an advertisement for their city and sometimes the forming of acquaintances that would bear commercial fruits for years to come, could be so foolish as to tax this new business friendship with so costly a welcome.

Greater Safety for Drivers

I also wish to call attention to the safety devices used for the protection of drivers. I would suggest that a committee of three veteran drivers be appointed at each meet to look over the course not less than 5 days before the race and formally to pass on its safety. Had this been done at Tacoma and Des Moines last season, we might still have with us Billy Carlson, whose death was due to the lack of a guard rail at the former speedway. A bursted tire carried Joe Cooper to the guard rail at Des Moines and as this rail was a frail affair the car crashed through, taking Joe as a toll of its inefficiency. The safety zone at the latter speedway was cause for another accident in which Billy Chandler's mechanic met his death. When safety zones are rough and soft they can hardly be intelligentaly salled safety zones.

Most everyone directly connected with the sport knows of the claims and counter-claims that have arisen owing to the faulty checking of cars. This has long been a source of disputes and should be done under the direction of the Speedway Association or the American Automobile Association by a trained force of checkers. These men familiar with the work should be employed at all the races, thereby doing away with the old system of picking them up at each meet, sometimes making it a privileged position, regardless of the ability and experience of the person. I am afraid baseball would be an uninteresting game if the umpires were hired in a like fashion.

America's Second Race Two Decades Ago



HORSELESS CARRIAGE CONTEST.

In the Days When Gasoline Sold at 7 Cents and a 7-Horsepower Car Was a Monster

EDITOR'S NOTE—Next Tuesday is the anniversary of the first motor car race ever run in the East, held May 30, 1896, a few months after the Times-Herald race over the Chicago boulevards in 1895. Probably no better comparison of epochs in science and invention can be made than in putting present day speedway results in the balance with the earliest efforts to conquer space by motor vehicle. The illustrations used were taken from the Cosmopolitan Magazine's report of the event and the one of the winning car from the Scientific American of June 13, 1896. "The Start from City Hall Park," on the next page would hardly satisfy present day fans as an illustration. When you listen to the roar of exhaust at Indianapolis next Tuesday, think of the other extreme from that you are witnessing before you. You will find food for thought in the evolution that has taken place in a score of years.

THE spectacular growth of the motor car industry and the swiftness with which the mechanical side of the car has been perfected are most vividly brought home by reminiscenses of John Brisben Walker when he stated that only 20 years ago the highest product of the inventor's skill was able to make an average racing speed of only 5 miles an hour. That was when gasoline sold for 7 cents a gallon, and when a 7-horsepower car was considered a giant.

Mr. Walker was a pioneer in the effort to make the motor car a commercial success. Although engaged in an entirely different field of activity, as editor and owner of the Cosmopolitan magazine, he was one of the first to foresee the great possibilities of motor-driven vehicles. The manner in which he backed his vision with his money when the crude specimens of the invention were the object of universal sneers and laughter now offers perhaps the most interesting chapter in the car.

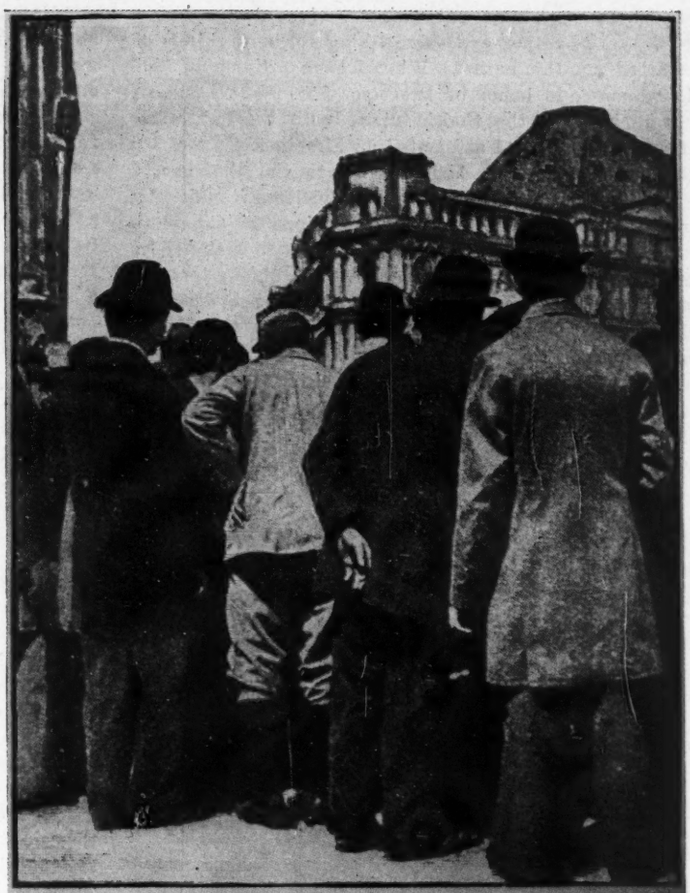
THE DURYEA MOTOR WAGON.

He looks back with particular pride upon those days when his daring broke the ground upon which has been erected the stupendous structure of the modern motor industry. He

is still known as "Colorado's Man of Vision," whose plans for the development of the state partake of the same originality and courage that characterized his pioneer adventure in the motor car field.

On Memorial day, 1896, this substantial sponsor of things new in mechanical realm promoted the first motor car road race ever held in the east, and the second race of this kind in the United States; and he put up a $3,000 cash prize for the winner. This was only about 6 months after the country's first motor car race, which was held at Chicago. Two years later, Mr. Walker organized the Mobile Company of America and at Tarrytown, N. Y., built the first factory to turn out cars on any considerable scale. His plant employed 1,800 men and had a capacity of fifteen cars a day.

The Cosmopolitan race was run along the Hudson river from the city hall of New York City to Irvington and return, the total distance being 46 miles. The event covered 2 days, the first day's run going to Irvington and back 4 miles of the course to the noted Ardsley club, where a dinner was given in honor of the occasion. There were twenty-one cars entered, three or four being electric and the rest one-cylinder gasoline cars. Only five succeeded in completing the course laid out for the first day's leg of the race.



THE START FROM CITY HALL PARK.

This historic event was won by Charles R. Duryea, of the Duryea Motor Wagon Co., in a car of his own make. His motor was about 5-horsepower, and he averaged about 5 miles an hour. His car had a cooling tank in lieu of a radiator, and this had to be aided by frequently throwing water on the engine by hand. No provision was made to protect the cooling tank against steam caused by the heating of the motor, which generated so much steam that part of the tank was blown off in front of Mr. Walker's house in Irvington.

The judges were John Jacob Astor, General Nelson A. Miles, Chauncey Depew and Colonel Albert A. Pope, head of the concern manufacturing Columbia bicycles and later Columbia electrics.

Shortly before building his Mobile factory at Tarrytown, in 1898, Mr. Walker had purchased the steam motor patents then secured by the Stanleys and also their small Locomobile factory at Newton. He soon sold the Newton plant to A. L. Barber, of the Barber Asphalt Co. He kept the Mobile plant at Tarrytown in operation until 1904, however, when the rapid development in gasoline motors and the sudden popularity of gas cars forced him out of business at heavy loss.

Two of Mr. Walker's sons, Justin and Randolph, were respectively factory manager and sales manager of the Mobile firm, and another son, Harold, worked in the plant as a mechanic and had charge of testing all the new cars. All three have figured prominently in motor events. Randolph won the first Vanderbilt cup at Newport in a Mobile, in the then startling time of 1:33⅘ for the mile race. He and Harold drove the first steam car seen in New York, and great crowds turned out to see their demonstration. These two brothers also drove one of the 500 cars in the big Pan-American exposition race started from New York to Buffalo in 1901, and were in the lead when the race was called off at Rochester on account of the assassination of President McKinley. They were driving a wagonette type Mobile, equipped with two boilers, which required 70 gallons of water about every 20 miles. They could get up a speed of 35 to 40 miles an hour for spurts of 8 or 10 miles. One exciting experience of that race was the necessity of telegraphing to New York and having a new boiler shipped to Herkimer to replace one they had burned out.

COMMITTEE INSPECTING A CARRIAGE.

John Brisben Walker helped to organize the Automobile Club of America 15 years ago and is one of the few charter members now living.

In a way, the Walker family originated the jitney bus idea and at least encountered considerable of the

kind of opposition now being lined up against this institution.

Randolph and Harold Walker started a motor bus line of fifteen Mobile wagonettes in New York in 1902 and were arrested for operating without a franchise. They had hack licenses for all their cars, but they and all their drivers were arrested at the instigation of interests running horse-drawn bus lines. So the Walkers gave up this attempt, after demonstrating the success of their cars.

"My interest in the automobile industry has cost me in the neighborhood of 3½ million dollars," says John Brisben Walker, "but I am glad to feel that I accomplished something worth while toward its development as one of the world's greatest enterprises. I've always had a rather expensive liking for new things of this nature. When I gave a dinner in 1903 in honor of Professor Samuel P. Langley, of the Smithsonian Institute, just after he had attempted an airship flight and his machine had fallen into the Potomac, I was laughed at as a visionary trifler by men holding high positions in the engineering world, one of whom declared he dared not even attend this dinner for fear of being taken to task by the directors of his big company. But one of the Wright brothers and Santos Dumont were among my guests on that occasion, and you can well imagine that my interest in aviation developments has been more than ordinary.

Winner of 1896 Race Tells of Event

Reminiscences of Charles E. Duryea on Race of 20 Years Ago

PHILADELPHIA, Pa.—Editor Motor Age—I am pleased to read Mr. Walker's reminiscences of the early days. I too have some very vivid memories of those times. Mr. Walker was perhaps not so well posted as to what could be done with motor cars then as he afterward became. Had he been he would not have expected us to reach the Ardsley Club over a road in construction which, covered with broken rock, was as bad as the bed of a mountain stream. We could hardly drive down it, much less up it. We were asked to evolute on the lawn, said lawn being also in process of construction, having been plowed and sowed and the young sprouts were just peeping through. How much we damaged the young industry that day by showing what a motor car could not do in a plowed field, will never be known. Certainly we did not show the high speed that foreign cars were reputed to make over perfect roads, but the Duryea cars did get out of the club grounds by climbing a rocky hillside with some pushing while some newspaper men cruelly stabbed us in the backs with their cameras and thus recorded for all time our failure to meet the impossible conditions imposed on us by Mr. Walker.

Takes All Prizes

We got the prizes, however; all of them —total $3,000—and the Duryea cars were the only ones able to return to the city the same day. There, as at Chicago the fall before, we proved the superiority of the American product and defeated the foreign representation. The only foreign car that was able to reach the club house was not able to get out at all and so did not return to New York until next day after being towed out.

So hard was the service that steam was formed faster than the overflow pipes could take care of it and before we knew it the tank seams had started and hot water reached our belts so we had belt-lacing troubles galore. We had dropped a perfect gear drive to take up belts in 1896 because every fool engineer in the land asked us why we did not follow foreign practice in that matter. One year of following showed us that America led, and we went back to gears promptly.

Discouraging Delays

Mr. Walker is wrong about the speed. The promoter was the slow one—not the cars. The contest was to begin at City Hall park at 9 a. m., but no signal to start was received until noon. A platoon of cycle riders was to escort us up through the city, but we ran away from them before reaching Twenty-third street. We were to re-form and start a real race at Kingsbridge, but no starters appeared so after some time we went on. The evolutions at the club took much time. We waited for judges at Kingsbridge on the return. All told we spent the whole afternoon until dark doing the 50 miles or over but it was not lack of speed that made the slow time. Those same cars did 5 miles under 12 minutes at the Rhode Island State Fair grounds 3 months later. On that memorable Memorial Day I had with me E. P. Ingersoll, owner of the first motor car journal in the English language—another score for America—as observer, and so fast did we drive down some of the hills that he questioned the safety of the steering. We had no goggles and for the first time in my life I noticed the tears rolling back over my ears. It takes a little speed at least to beat gravity that much.

The same remarks apply to the Chicago contest. It was run in deep snow and some time was lost making repairs, but even at that no teams were able to keep up and we beat the best foreign cars. Most editors, not knowing the facts, gave us credit for slow time, but that Chicago winner could do better than 20 mile per hour and frequently averaged 16 over the then not good roads about Springfield, Mass. It was more than twice as fast as horse speeds on the road.

Nor should your readers imagine that foreign cars did better. We entered the London to Brighton run in England in November, 1896, and, starting well back in a line of nearly fifty cars, plodded along behind a slow-going electric bath chair for the first 10 miles before we could find a space sufficiently free of spectators to permit passing and going after the leaders. Those leaders were the first, second and third winners of the great French race of that year which, with their drivers, had been brought to England to show the British how the new vehicles could run. Our time to Brighton, 52 miles, was over an hour less than any other car so we beat the foreign race winners more than an hour in that last 42 miles when we were free to go.

It is true that the cars were low powered. We built them for people who did not own horses and could not afford large expense bills. No one imagined that men with money and able to hold the lines over a beautiful pair of horses ever would drive a machine buggy, but part of the low rating was due to our stating the working power instead of the maximum. We kept the speed of the motor low and expected the margin to pull the car out of the extra bad places. Thus the three-cylinder motor designed in 1897 was rated at 6 horsepower, but later rated at 15 and in those early years delivered as much as 22 under favorable test conditions.

Boosters Got No Help

Mr. Walker can well be proud of his record as a pioneer in the motor industry. I should think monied men would hang their heads with shame when they see that in this great country only two patrons of the industry arose and helped the mechanics who were fighting to give cheap and fast transportation to the people. The names of Kohlsaat and Walker should hang in every motor club house with wreaths around them. They were the patron saints of the new business. They gave money, standing, time and advertising free to the baby industry. Would there were more like them for America's good.—Chas. E. Duryea.

MAKING CARS IN JAPAN

Tokio, Japan, May 15—Increased manufacture of motor cars in this country is indicated by the import figures for 1915 which show a falling off as compared with those of 1914. The total from foreign sources in 1915 was twenty-six cars valued at $30,595, whereas in 1914 the imports were seventy-nine cars valued at $106,420. Most of the cars being manufactured here are low-priced, thus affecting the imports of higher-priced foreign cars.

A firm owning a taxicab service in this city is now operating forty-two American-made cars, averaging 700 passengers daily.

How to Get to the Indianapolis Race

Best Routes Outlined Within a 250-Mile Radius and Conditions Along the Way Told in Brief

TO assist motorists in reaching Indianapolis and the 500-mile speedway race, May 30, Motor Age, according to its usual custom, herewith presents the established routes within a radius of 250 miles of the Hoosier capital. On the next page is shown a map of the various routes, and on the following pages route directions and actual road conditions described, the road data having been secured from garages, clubs and others familiar with present conditions in their respective districts.

From Chicago, Crown Point and Lafayette

The old and better known route through Crown Point, Rensselaer and Lafayette, as heretofore, will get the bulk of the travel. This trip can be made in 1 day as the road conditions are good with hard roads practically the entire 197 miles, with the exception of a very few miles between Thayer and Rensselaer. This route takes one through Riverdale, Dolton, Oak Glen, Munster, Highland, Schererville, Crown Point, Thayer, Rensselaer, Remington, Wolcott, Montmorenci, Lafayette, Frankfort, Antioch, Lebanon, Royalton and Bootjack into Indianapolis.

To avoid the congestion of travel on this route, an option is to go east from Highland on the South Bend route through Hobart and Valparaiso to Laporte and then south through Knox and Winamac to Logansport, then direct to Indianapolis via the Michigan road or over to Kokomo and then down. The distance on this routing is 220 miles—all hard road. Another routing is via Morocco, Fowler and Attica to Crawfordsville and then to Indianapolis. The distance on this route is about 215 miles. This is a good route for those who desire to spend more than 1 day for the trip.

Another route is to go direct to Lafayette and from there to Crawfordsville. For those desiring to stay over night at either Lafayette or Crawfordsville, this is a good way, although there are a few rough stretches, as the route from Crawfordsville into Indianapolis passes the speedway and it is not necessary to go into the congestion of the city at all.

From Milwaukee

Although considerable improvement has been effected on the short route between Milwaukee and Kenosha, there are a few miles just north of Waukegan that are poor, and especially in dry weather the better route is through Franksville and Corliss or via the Kilbourn road. Both meet at a point just west of Kenosha and follow what is commonly called the Green Bay road, almost straight south through the edge of Lake Forest, meeting the shore road at Fort Sheridan. This is followed to a point just north of Glencoe, where the inside road, following along the railroad on the west side all the way to Evanston, is preferable. From Evanston down, Sheridan road is in excellent shape to Chicago. From here on, follow one of the routes outlined from Chicago to Indianapolis.

From Madison and Janesville

Here again there are many opportunities for optional routes, but it is believed the most direct is about as good as any, and with the exception of 2 or 3 miles near Harvard, this is gravel, with some macadam all the way. It passes through Janesville, Harvard and Algonquin, coming into Chicago on the Higgins road. From Chicago on, follow one of the routes outlined in the Chicago to Indianapolis routes.

From Clinton, Ia., and Dixon

There is not much choice of routes here, as the best road will be via the Lincoln highway through Sterling, Dixon and Rochelle clear into Chicago, although some will branch off at Geneva, following the Lincoln highway through Aurora and Joliet to Dyer, then south through Morocco, Attica, New Richmond, Crawfordsville and Jamestown into Indianapolis. Those who are especially desirous of avoiding the congestion of travel out of Chicago might come down to Davenport and then follow one of the routes outlined below from there to Indianapolis. This is practically all dirt road, however, and in wet weather would not be anywhere near as good as the ones outlined.

From St. Louis and Terre Haute

The most direct route, of course, is via the Old National road through Vandalia, Effingham and Terre Haute. This is a fair road. Of course from Terre Haute on the roads are all hard. The distance on this route via the National road all the way is 243 miles. The National road through Brazil is worn in some places and quite a few prefer to go up to Rockville and then in via Danville.

Another route which is gaining in favor is to go through Edwardsville to Litchfield and then east through Hillsboro, Pana, Shelbyville and Mattoon to Paris. Here it is possible to go into Terre Haute and meet the National road there, or a better route is direct through Clinton to Rockville and then into Indianapolis via the Pike's Peak route. The distance on this is about 295 miles.

From Davenport and Peoria

This routing will take care of travel from Galesburg, Peoria and Bloomington and is a very direct route through those points. At Bloomington there is a choice of routes—one via Lafayette and the other via Champaign. The better roads are on the latter, although distances are about the same. Roads are for the most part dirt to the Indiana line. They are all well-traveled roads, however, and should be in excellent condition for the Memorial day travel.

From Quincy and Springfield

On account of the increased interest in the Pike's Peak Ocean-to-Ocean highway, it is believed that the best routing from Quincy to Indianapolis is to go down through to East Hannibal and then go east on the Ocean-to-Ocean highway through Jacksonville to Springfield, continuing direct through Decatur and Rockville to Indianapolis. While most of this in the Illinois section is dirt road, it is generally well cared for. The total distance from Quincy is 323 miles, while it is 198 miles from Springfield to Indianapolis.

From Louisville

The better route this year is via Salem, Vallonia and Seymour and north through Columbus. This is about 10 miles longer than the direct route through Scottsburg.

From Grand Rapids and South Bend

The most direct routing here is the best and passes through Kalamazoo, Decatur and South Bend, with an option from Rochester south, as indicated on the map. There is little choice in these two routes. The more direct is through Logansport via the old Michigan road. Considerable improvement has been effected on this recently, although there are still a few short stretches in need of resurfacing on the option to Peru and Kokomo. This is all good, except about 10 miles between Rochester and Peru. This is soft, gravelly dirt—some parts rather rough. There is very little difference in mileage. The total distance from Grand Rapids is a little over 250 miles either way.

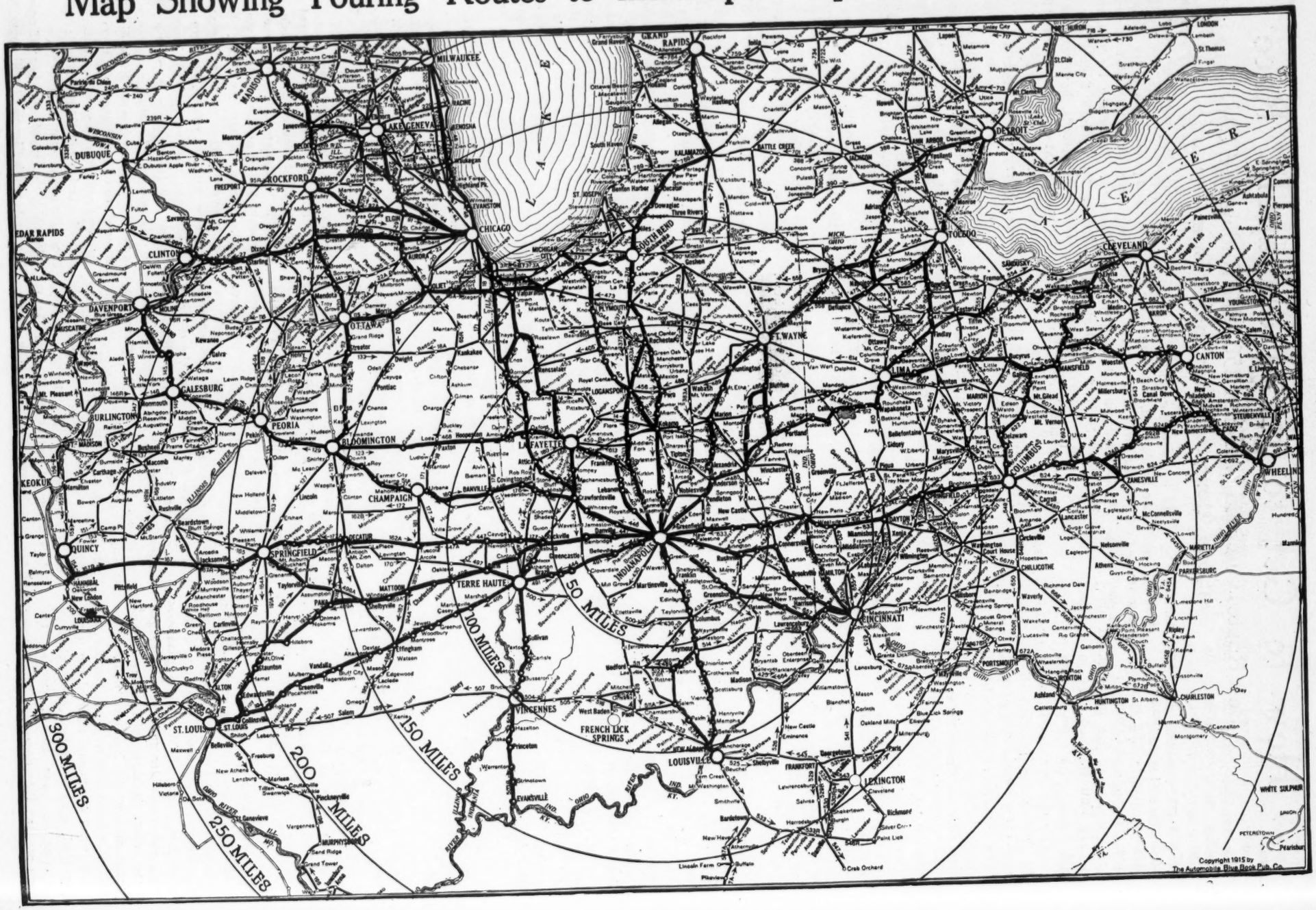
From Detroit and Fort Wayne

On account of the improvement now under way between Erie and Toledo, those going to Indianapolis for the races will probably find it advisable to go via Ypsilanti, Adrian, Bruay and Fort Wayne. Eighty-five per cent of this is gravel or macadam with, of course, concrete nearly all the way to Ypsilanti. Between Fort Wayne and Indianapolis there is a choice of routes—one via Marion and one via Muncie, but there is very little difference in road conditions, both of them being excellent gravel with good accommodations at both Marion and Muncie.

From Cleveland and Muncie

Probably a great number of people driving through Cleveland will come down

Map Showing Touring Routes to Indianapolis Speedway Race, May 30



to Columbus through Mansfield, Galion and Delaware, but it is believed that the most direct route, with just as good road conditions, is the road to Bellevue and then to Lima via Tiffin, Fostoria and Findlay, then to Indianapolis through Celina and Muncie. There is practically no dirt on this route and most of it is excellent gravel or macadam. The distance on this routing is 315 miles.

From Wheeling and Columbus

On account of the improvement along the old National road between Wheeling and Zanesville, several detours will have to be made because of different sections of the road being closed. One of these stretches extends from Zanesville to Reynoldsburg. Because of these closed sections on the National road, it probably will be preferable to use the slightly but longer option indicated through Cadiz, Coshocton and Newark. Ninety-five per cent of this is macadam or concrete—the last 14 miles of which is at the present time under construction.

Columbus to Indianapolis is very direct, either on the old National road or through Dayton and Eaton. Most people find the latter preferable, as it is almost as direct, with slightly better roads and considerably better accommodations. The total distance from Wheeling on this routing is 330 miles.

From Cincinnati

There are a number of good routes from Cincinnati to Indianapolis, as shown on the map, with very little choice in road conditions. All of them are over gravel or macadam. On account of congestion on the route between Richmond and Indianapolis, it is believed that persons from Cincinnati will find it preferable to use the route through Rookville, Connersville and Rushville, which is slightly better than the one through Greensburg and for that reason is favored.

What They Say Along the Way

From Chicago to Lafayette

THERE is a new and better way from Chicago to Lafayette, which practically is all stone road. It is a few miles farther, but conditions are such that good speed can be maintained. This route lies farther to the west, and includes Shelby, Thayer, Enos, Morocco, Ade, Brook, Goodland and Remington, picking up the other route at this point.

Leaving Crown Point proceed as follows: South 9 miles, jog east, then south again 6 miles to Shelby. Southeast 2 miles to Thayer, south 6 miles, jog east, south 3 miles, west 2 miles, south 2 miles, west 4 miles to Enos. South 5 miles to Morocco. Straight through 2 miles, jog east. One mile south, ½-mile east, 2 miles south to Ade. East 4½ miles to Brook. Proceed straight through Brook, passing George Ade's farm at 2 miles, and turning south 4 miles east from Brook. Proceed south 7 miles to Goodland, turning east at Church to Remington at 7½ miles, following same road to Wolcott 6 miles. Turn south 9 miles, east to first road to right, and south to Montmorenci 11 miles. Southeast past school house and church on right to Lafayette 9 miles.

Rough Near Rensselaer

On the Rensselaer route motorists will find the road very rough in the vicinity of Rensselaer. From Wolcott to Lafayette the road is a good average; from Montmorenci into Lafayette, very good. From Lafayette to Indianapolis, by way of Frankfort, which is the only logical route, the roads are generally good throughout the entire distance. There are no interruptions except that the bridge across the Wild Cat creek, about 1 mile east of Dayton, is being rebuilt, and a temporary structure has been erected. Drivers should be cautious, inasmuch as the floor is very irregular and the approach is none too good. This route is through Dayton, Mulberry, Frankfort and Lebanon to Indianapolis, and is preferable to the one via Crawfordsville.

It requires about 3 hours to make the run from Lafayette to Indianapolis.—Shambaugh's Garage, Lafayette, Ind.

From Toledo and Lima

There are two routes between Toledo and Lima; the one via Bowling Green, Leipsic and Ottawa is good; via Bowling Green and Findlay, just fair.

The road between Mansfield and Lima reported as good, and the road from Lima to Indianapolis, good.—Baxter Bros., Lima, O.

From Wheeling, W. Va., and Columbus, O.

Starting at Wheeling, cross over the Bridgeport, follow the National road by way of St. Clairsville to Cambridge. This should be good by the Fourth of July. Follow the National road from Cambridge through Zanesville, Jacktown, Newark and Granville to Columbus. This gives an improved road all of the way from Columbus and practically all the way from Wheeling.

A second routing would be to leave Columbus via West Broad street straight to Springfield. On entering Springfield, turn to the left to High street. This is important, as the road entering Springfield is very bad on Broad street. Follow High street practically straight to Richmond, National road from Richmond to Indianapolis. These roads should be excellent at that time and are very easily followed.—F. E. Avery & Son, Columbus, O.

From St. Louis and Terre Haute

Repair work is in progress in many places on the road between St. Louis and Terre Haute. This is the National Old Trails road; if rain does not occur should be in good shape at the time of the races.

The road to Terre Haute, via Mattoon, will be in good shape if there is not a heavy rain before May 30.—St. Louis Automobile Club, Matthew F. Morse, St. Louis, Mo.

Road from South Bend

The road from South Bend to Lakeville has been improved, as also the stretch between Lakeville and Plymouth which heretofore has been very bad. A fine stretch of road extends the balance of the way to Indianapolis.—Frazier and Frazier, South Bend, Ind.

Michigan City to Indianapolis

The road between Michigan City and Indianapolis at this time is in good condition, and, if we do not have heavy rains previous to the race, should be in excellent condition at that time.—Arthur E. Dunn, Logansport, Ind.

From Davenport and Galesburg

If we have had several days of rain, motorists are advised to go to Indianapolis via Chicago.

Under ordinary conditions leave Rock Island court house, go west to 12th street, turn left, follow road to Milan, pick up Clover Lead—poles marked with clover leaf—route and follow to Galesburg. Good road oiled much of the time.

From Galesburg, go through Knoxville and straight ahead on main traveled road to Peoria, over fair road, and Bloomington.

River-to-River road west of Davenport is in good condition also the White Pole from Muscatine.—Davenport Auto Club, Davenport, Ia.

From St. Louis and Terre Haute

Terre Haute to Indianapolis, we find through experience that the road from Terre Haute to Rockville and Danville is the best into Indianapolis.—Hoosier State Automobile Association.

From Cincinnati

The best route is via New Trenton, Brookville, Connersville, and Rushville, and the most picturesque.—Hoosier State Automobile Association.

From Louisville

The better route is via Pekin, Salem, Vallonia, Browntown and Seymour, then north through Columbus and Franklin. There is a stretch of about 3 or 4 miles in this road between Pekin and Borden that is not very good but is passable.—Hoosier State Automobile Association.

From Springfield and Champaign

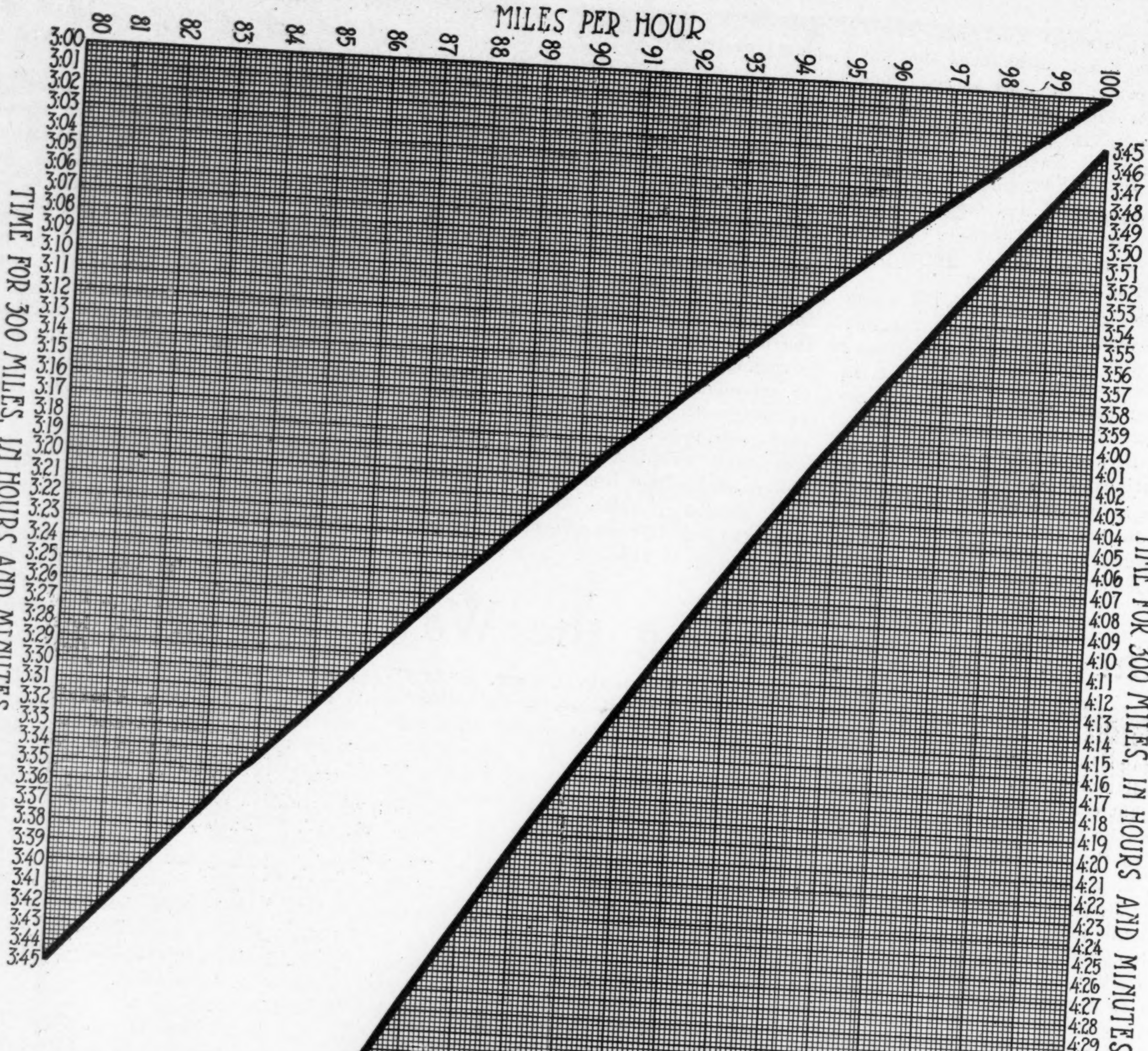
The best route is the Pike's Peak Ocean-to-Ocean highway. This is in fair condition. From Champaign go south to Tuscola where you pick up the Pike's Peak Ocean-to-Ocean highway which you follow to Indianapolis. This route is in good condition.—Hoosier State Automobile Association.

From Wheeling, Columbus and Richmond

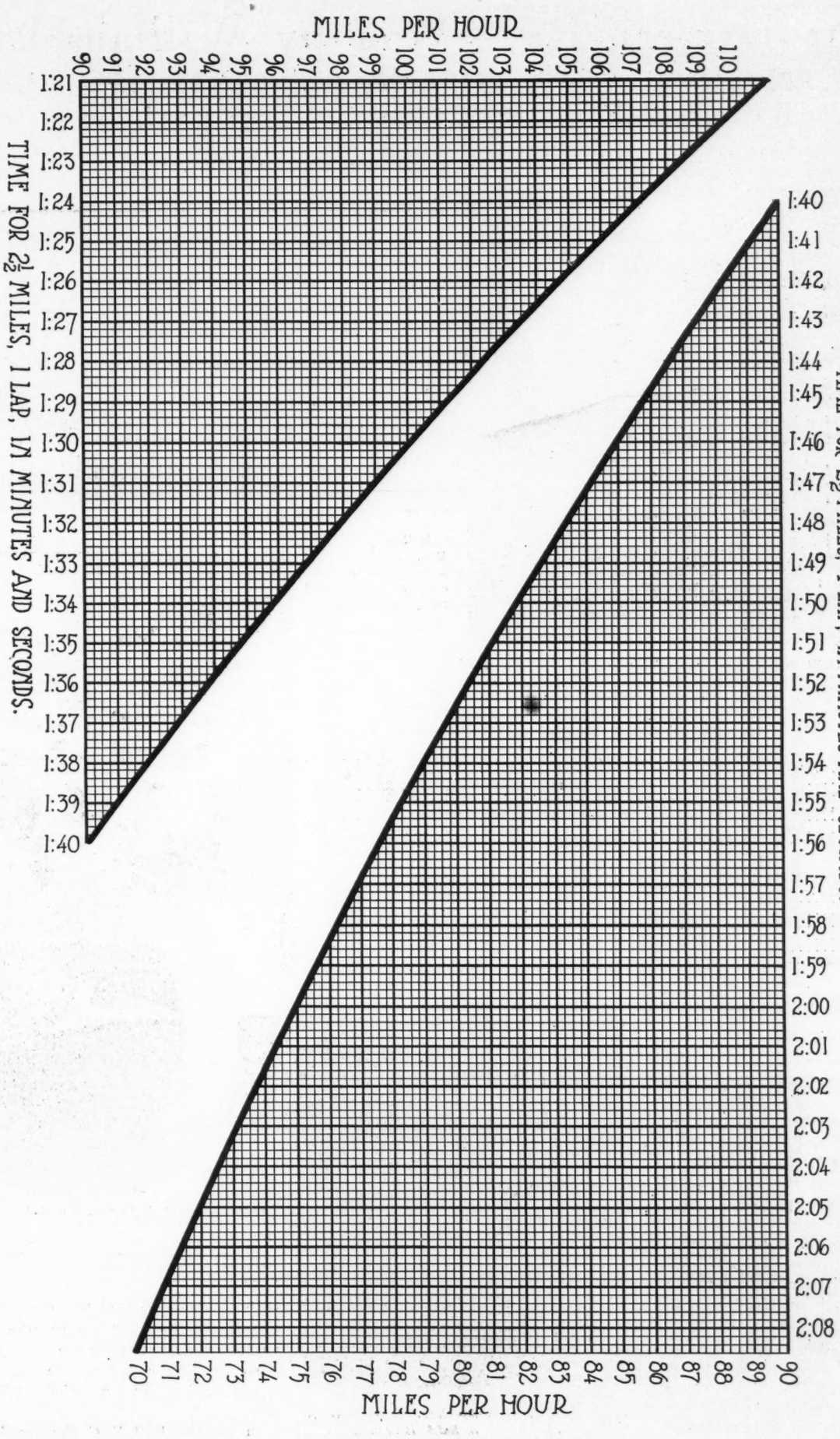
From Columbus to Richmond it is necessary to detour from the National road at Eaton and go west to Boston then north 6 miles to Richmond.

The highway is O. K. between Richmond and Indianapolis, and motorists will find the road from Cincinnati in good condition.—C. R. McConaha, Richmond, Ind.

Speed Chart for 300-Mile International Sweepstakes Race



Speed Chart for Lap Times on Indianapolis Speedway



Amateur Drivers' Race Won by William Leet

First Event of Its Kind in America Taken By a Mercer at 86.8 M. P. H.—Warren's Cadillac Second—R. R. Duff Sets Amateur's Speedway Lap Record of 94 M. P. H.

Al Shillo is presented with cup, trophy in dealers' race, by President Reid

William Lect and Mat. Apts in the Mercer that won the amateur event and the prize trophy

How They Finished

AMATEUR RACE—30 MILES

Finish	Car	Driver	Car	Time	M.P.H.
1	Mercer	William Leet	Omaha Auto Club	20 :44.4	86.8
2	Cadillac	Frank Warren	Speedway Park Ass'n	21 :48.4	82.4
3	Mercer	William Robbins	South Shore C. C.	22 :15.2	81.0
4	Cadillac	Frank Book	Detroit Ath. Club	23 :04	78.0
5	Mercer	F. C. Sawyer	Chicago Ath. Ass'n	23 :14.2	77.5
	Mercer	Dr. R. R. Duff	Cent. Mfg. Dist. Club	Out 11th	
	National	A. C. Ortmeyer	South Shore C. C.	Out 4th	

DEALERS' RACE—50 MILES

Finish	Car	Driver	Time	M.P.H.
1	Mercer	Al Schillo	34 :35.1	86.7
2	Cadillac	C. DeConstant	35 :20.4	85.0
3	Mercer	A. W. Bromstedt	36 :40.1	82.3
4	Mercer	F. Schillo	38 :00.3	79.0
5	Cadillac	O. H. Yarnell	38 :27.2	78.0
6	Haynes	E. J. Ford	41 :51.2	72.2
7	Cadillac	Bug Lydecker	41 :52	72.0

By William K. Gibbs

CHICAGO, May 21—America's first amateur speedway meet was won this afternoon by William Leet in a Mercer at 86.8 miles per hour. Yesterday the ten entries were divided into two groups of five each, and two heats were run to eliminate one in each heat, before J. Pluvius transformed the 2-mile board oval of the Maywood speedway into a skating rink, and sent several thousand enthusiastic spectators who had gathered to see the first non-professional race ever staged on an American speedway to the shelter of trains and curtained cars or limousines.

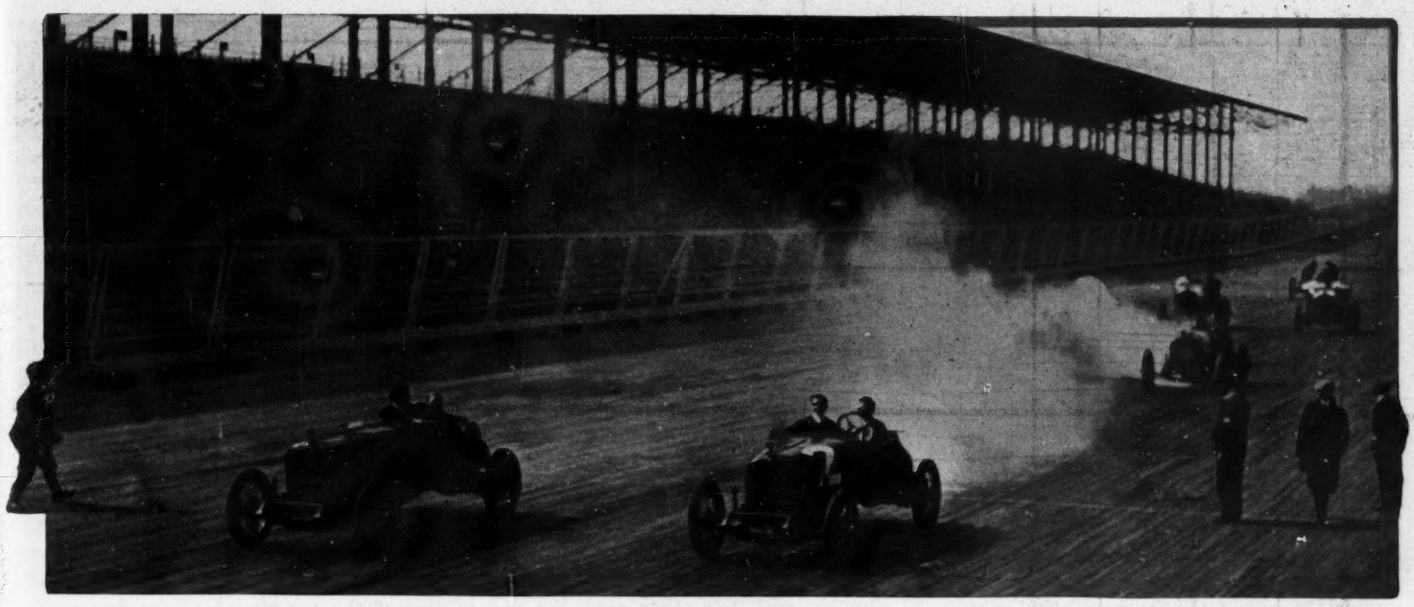
The ten cars entered were sent away in groups of five for 20-mile heats, the first four to finish in each heat qualifying for the final 30-mile dash. When the two heats had been run and the eight fortunate cars were rolled to the line for the final sprint, the clouds that had threatened all the afternoon opened and put the quietus on further activities for the day. Referee Vissering then called off the final of the non-professional race and the 50-mile dealers' race.

Left to right—Mrs. W. A. Leet, Mrs. M. C. Apts and Miss Ruth McNaughton, snapped as Leet won amateur race

Above—Count de Constant and A. B. Kayser in the Cadillac eight which won second place in dealers' race

Below—Frank Warren and Bud Lydecker in Cadillac which took second place in amateur event

In the first heat F. C. Sawyer, Mercer; W. M. Robbins, Mercer; William A. Leet,



Getting away for the final heat of the Western Inter-Club nonprofessional trophy race

Mercer; Frank P. Book, Ralph de Palma's millionaire backer, Cadillac; and Harold N. Scott, Locomobile, got away well bunched and held their starting positions until the end of the sixth lap. Then Sawyer made a short stop at the pits, due to a misunderstanding of pit signals by the mechanician, but got away in 15 seconds, dropping to third place and then to fourth on the next lap when he had to change a right rear tire. Leet went to the front in the eighth lap and held his lead to the end, his time being 14 minutes and 49 seconds for the 20 miles, averaging 81 miles per hour. Robbins was second, time, 14:50.1; Book third, time, 15:16.1; and Sawyer fourth, his time being 16:38.2.

Duff First in Second Heat

First place in the second heat went to Dr. R. R. Duff, who drove his Mercer at an average speed of 80.25 miles per hour, covering the 20 miles in 14:58.1. Leet's fastest lap was turned at 1:20.4, or 90 miles per hour. The next fastest went to F. C. Sawyer, who made the circuit of the 2-mile track in 1:21.1, or 89 miles per hour.

In the second heat Dr. R. R. Duff, Mercer; C. H. Robbins, Mercer; Frank B. Warren, in a Cadillac; A. A. Clemens, in a Stutz and Andrew Ortmeyer in a National, got away in the order named. With the second heat under way the crowd saw some brushes that made cheering the order of the day, for Dr. Duff, who led for two laps, was replaced in front of the stands by Robbins, but regained first place in the seventh lap. Robbins' car was out in the last lap with burned bearings. Ortmeyer's National went to the pits in the third lap, but when Robbins dropped out and after Dr. Duff had flashed across the line and got the checkered flag, Ortmeyer went in again and finished the other seven laps and qualified to enter the finals.

Final 30-Mile Dash for Western Interclub Trophy

CHICAGO, May 21—William Leet, in his red Mercer, ground out each of the 30 miles in the final dash of the Western Inter-Club trophy race in 41.4 seconds, taking the honors and silver cup in the first amateur race ever held on an American speedway. Leet, who drove under the colors of the Omaha Auto club, completed 15 circuits of the board oval in 20:44.4, his average speed being 86.8 miles per hour. He was about one-half lap ahead of his nearest competitor, Frank Warren, representing the Speedway Park Association, who drove his Cadillac across the tape 1 minute and 4 seconds behind the winner, while William Robbins, representing the South Shore Country Club, in a Mercer, finished third, being 27 seconds behind Warren. Frank Book, entered in the name of the Detroit Athletic Club, driving a Cadillac, was fourth, and F. C. Sawyer, driving under the colors of the Chicago Athletic Association, fifth, their times being 23:04 and 23:14.2 respectively.

Robbins Gives Way to Duff

William Robbins led the field up to the end of the third lap, with Dr. R. R. Duff less than a car length behind. Duff, jumping into the lead in the fourth, held it until the end of the sixth, when Leet took first position and held it until the finish. Duff and Leet drove a neck and neck race until the end of the eleventh, when the former was forced to retire with a broken oil pump.

However, Dr. Duff won an honor not scheduled in the program. After taking the lead in the fourth lap he went into the fifth with a spurt that was clocked at 1:16.2 or a speed of better than 94

Dr. R. R. Duff in his Mercer getting the checkered flag in the second heat of the amateurs' race

Al. Schillo and A. W. Bromstedt in a brush on the turn just before coming into the homestretch

miles per hour, the fastest time ever made by an amateur on the Chicago track.

Sawyer appeared to be a likely third up to the end of the fourteenth lap, when he was forced to the pits for a tire change and dropped into fifth position. Robbins, who finished third, lost some time at the pits early in the race, when he came in for a new spark plug. A. C. Ortmeyer, the only other contender for the Western Interclub trophy, docked his National with engine trouble after completing 8 miles. Ortmeyer developed difficulties but got his car under way again after three others had finished, and qualified for the finals.

Al Schillo Takes 50-Mile Dealers' Race at 86.7 M. P. H.

CHICAGO, May 21—With Al Schillo at the wheel, the same Mercer with which William Leet won the amateur event showed the way to the six other entrants in the 50-mile dealers' race, maintaining practically the same speed as in the first race of the afternoon. Schillo's time for the half century was 34:51.1, and his speed 86.1 miles per hour. The Cadillac finished second in the dealers' race as de Constant losing to Al Schillo by a margin of only 45 seconds. A. W. Bromstedt, in a Mercer, took third after he had challenged Schillo for the lead for 40 of the 50 miles. On the twenty-first lap Bromstedt threw a right front tire in the back stretch and came into the pits on the rim. He lost a lap in making the tire change and was unable to recover it.

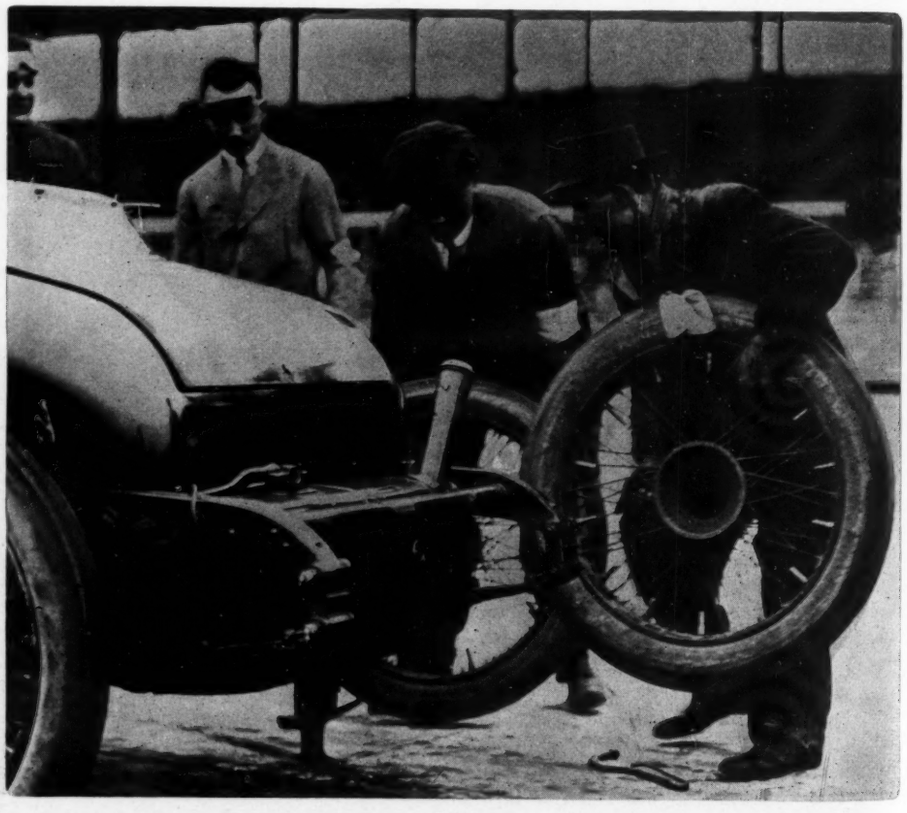
Sympathies with Ed Schillo

The sympathy of the crowd seemed to be with Ed Schillo, brother of the victor, as he drove under a self-imposed handicap of one lap brought about by lack of familiarity with the A. A. A. rules. In the pacing lap he found his Mercer hitting on three in the back stretch, but kept up with the other six entrants and was so close when the starting line was reached that Starter Tom Hay sent the field away while Schillo stopped at the pits to put in a new plug. Had he understood the rules and dropped back instead of trying to keep up with the other cars, the red flag would not have been given and he would have started on an even basis with the others instead of one lap behind. However, in face of the handicap, he overtook O. H. Yarnell's Cadillac, P. J. Ford's Haynes and Bug Lydecker's Cadillac, finishing in fourth place, while the other three just mentioned took fifth, sixth and seventh places in the order named.

Al Schillo finished the first lap in third place, then drove into second place, which he held for three more laps and in the fifth jumped into the lead, from which he was never headed, he and Bromstedt in a Cadillac furnishing some interesting brushes before the stands from the fifth to the twenty-first lap, when the latter cast a tire and lost his place to Constant.

Out of the experiment of the first amateur speedway race is likely to come more events of a similar character, as it was proven today that there is a field for non-professional competition in this country and that amateur drivers have the requisite skill and courage to make the sport entertaining, safe and popular.

Rain threatened another postponement today, but by diligent work on the part of the force of sweepers, much of the water was removed from the low places in the track and the wind and occasional flash of the sun did the rest, so that by 3 o'clock it was dry enough to start the amateur race and the dealers' race followed immediately after.



Changing a tire on F. C. Sawyer's Mercer in the first heat of the amateur's race

Mobilization Practice

Sheepshead Bay Speedway Is Scene of Military and Naval Tournament

More than 8,000 Men Transported to the Course in 2 Hours

SHEEPSHEAD BAY Motor Speedway, May 21—Motor cars and trucks played an important part in the mobilization of nearly 10,000 national guardsmen for the opening of the military and naval tournament here today. In approximately 2 hours all the troops except the cavalry, more than 8,000 men, had been embarked at the armories and transported to the speedway. Trains, armored motor trucks, motor cars, and wagons were utilized to carry the prospective defenders of the city to the point where they were to meet the enemy. The Seventh infantry marched from its armory to Fifth avenue, where more than 100 motor cars were waiting. The men were rushed out to the bay in 1½ hours.

The Fourty-seventh Regiment, stationed in Brooklyn, was borne to the field in motor trucks and buses. The other men went by train, going to Brooklyn bridge by elevated and subway and special trains to the speedway.

The guardsmen formed in a battle line before the grandstand and gave a mimic war, the problem being the attack of a superior force on a smaller army covering the retreat of its main body. The coast artillery, together with an armored battery, some engineers and signal corps men, defended one end of the enclosure and retired before the attacks of the infantry and field artillery units, aided by detachment of cavalry. Unfortunately for the picturesqueness of the battle, all the stirring sounds of warfare were stilled, drums, bugles and bands being forbidden to play while blank cartridges for rifles and cannons were taboo and no national guard aeroplane was allowed to fly on account of its noisy exhaust. Acting under orders from General O'Ryan, issued owing to complaint of the Kings County Sunday Observance League against the breaking of certain blue laws, the only noise the 8,000 spectators heard during the entire fight was the cracking of the rifles in a shooting gallery near the track which was not concerned over Sunday noises.

An amusing side to the spectacle, which was well worth watching, was the laughter which burst from the stand when the announcer asked the spectators to watch the dead and wounded being carried away under fire by the ambulance corps, it being somewhat difficult to imagine any dead and wounded resulting from such a silent struggle. Another great laugh went up after the sham fight when the troops passed in review before General O'Ryan, the companies passing silently in platoons for over an hour and a half, and the one band, the only music in the line, went by playing "Onward Christian Soldiers."

The armored trucks showed to good advantage in the maneuvers and the trucks, trailers and passenger cars all demonstrated their efficiency and flexibility for military purposes. Much satisfaction was expressed in military circles over their performance, both in the rapid mobilization of the troops and in their work on the field. The ambulance cars also showed their worth and despite the amusement which was caused by the pseudo-wounded soldiers the spectators watched their quick and workman-like operation with great interest.

Mobilization of troops at Sheepshead Bay

MANY RACES FOR COAST

Los Angeles, May 19—Plans are under way for a 100-mile race on the Venice road race course limited to cars of 231 cubic inches and under. The date suggested for the proposed event is July 4.

Interest in the revival of the Los Angeles to Phoenix Road Race is growing. Four entries have been promised already, in case the desert classic is staged this fall, and in each case no reference has been made to prize money, indicating a sporting angle which was largely responsible for the success of the first desert races. Boosters along the Arrowhead Trail are working to get a Los Angeles to Salt Lake race this fall.

Champion Driver Prizes

Winning of Title This Year Will Mean More Than It Usually Does

Lucky Individual Will Get Material Addition to Bank Account

NEW YORK, May 20—It means something this year to be declared the champion driver of 1916 by the contest board of the American Automobile Association, for the daring pilot so selected will not only get the title but in addition his bank account will be materially added to.

Thanks to the sportsmanship of several of the big concerns in the industry, Chairman Kennerdell, of the A. A. A. contest board, is able to announce that in addition to the title there will be a sum of $13,500 distributed among the first three to finish in the championship award table. In addition thereto there will be a $1,000 cup.

This purse received a most notable addition today when Chairman Kennerdell received a letter from the B. F. Goodrich Co., stating that the company had decided to give the sum of $10,000 to the A. A. A. to be distributed as follows:

To the driver awarded the championship, $5,000; to the driver scoring second position, $3,000; to the driver scoring third position, $2,000.

This championship award will be made according to a points system evolved by the contest board. The first of the championship events was the Metropolitan Cup at Sheepshead Bay, which was won by Rickenbacher in a Maxwell. The standing of the first five as a result of this race, is as follows:

	Points
Rickenbacher, Maxwell	600
Devigne, Delage	320
Vail, Hudson	170
Devlin, Duesenberg	90
Adams, Adams	55
Watson, J. J. R	35

In addition to the $10,000 Goodrich purse, Chairman Kennerdell also has accepted the offer made by the Bosch Magneto Co. of $3,500 in cash, and a $1,000 Bosch cup. Of this sum, $2,000 and the cup goes to the champion driver; $1,000 to second and $500 to third. Like the Goodrich purse, there is no string to the Bosch offer, it is on out-and-out gift.

The 300-mile race at Indianapolis on Decoration day is the next championship race.

Railbirds Watch Practice

Indianapolis Track Is Scene of Drivers' Preparedness Campaign

Makes Circuit of Course in 1:34—Records May Be Broken

INDIANAPOLIS, Ind., May 21—Although but five cars have been reeling off practice laps at the Indianapolis Speedway, a steady crowd of bleacherites are on hand every day. Yesterday, being Sunday, about 1,800 turned out in spite of the weather and saw some fast time made by Johnny Aitken and Eddie Rickenbacher. Each of these drivers made the circuit in 1:34. Barney Oldfield sent his car around for a lap in just over 1:35, but on the succeeding lap had to be towed by Rickenbacher. Examination showed that his Delage had a broken valve rocker arm. This is now being repaired.

Rickenbacher had a little engine trouble today, but will be out again in the morning. The car he was driving yesterday was not his own but that of his teammate, Pete Henderson, who is laid up temporarily with a slight illness.

Resta and Christaens, of Peugeot and Sunbeam fame, are both repairing their motors which suffered in the recent Sheepshead Bay, New York, event. One of the reasons that the drivers are so late getting to Indianapolis this year is because they had ample opportunity to try out their mounts in New York and those who are not repairing their cars are resting in the interval before the 300-mile event which takes place on Decoration Day.

Seven post entries have been refused to date. These include Mulford's Hudson Super Six, Adams' Special, de Palma's Mercedes, Vail's Hudson, Devlin Special, Olson's Special and and the Brown car from Detroit.

Sunbeam Weaknesses Being Remedied

The Sunbeam is the same car that ran in the Sheepshead Bay, N. Y., events May 18, but it is now receiving some overhauling in order to remedy the weakness which put it out of the contest in New York. It will be remembered that this car was forced to abandon the race due to damage caused by the tachometer drive.

The tachometer is mounted on the end of the camshaft and the high speed caused a fracture of the aluminum case surrounding the end camshaft bearing with the result that the oil ran out and a motor bearing seized. Christaens has overcome this weakness and prophesies that no little detail like that again will cause him to abandon the race.

Oldfield's Delage is the same car as has been previously described. He is now tuning it for the race.

Boillot Killed in Battle

PARIS, France, May 21—Georges Boillot, winner of the French grand prix of 1912 and 1913, has been killed in a fight with five German aeroplanes, after succeeding in bringing down one of the German machines before a bullet pierced his heart. Boillot, a second lieutenant, brought down his first German aeroplane, a Fokker machine, on March 31, in Haute-Alsace.

At the outbreak of the war he joined the Automobile Corps, and using the racing machine he had driven in the grand prix of 1912 carried out many dangerous missions as chauffeur for General Joffre. Later he entered the aviation service.

Boillot's first and only appearance in the United States was on the Indianapolis Speedway, May 30, 1914, where he broke the 350-mile record, his time being 4:15:22.69. He was forced to slow up in the 352.5 mile, the next lap, on account of a broken frame, finishing fourteenth in the race.

Boillot in a Peugeot will be remembered for his victory in the 1912 French grand prix, which he won after a heroic struggle with the late David Bruce Brown. In the 1913 event on the Amiens course, dashed over the 569-mile course at the rate of more than 72 m.p.h., winning after a hard struggle with Goux in a Peugeot and Chassagne in a Sunbeam.

Boillot gained renown as General Joffre's chauffeur. His eagerness to gratify the general's desire for haste led him to take unnecessary risks. After one particularly narrow escape General Joffre announced his intention to make a change of chauffeurs, not so much because of the danger to which he was subjected as because Boillot's daring swerves kept him awake. The general liked to sleep during his 100-mile dashes along the battle front. Boillot accordingly went to the aviation corps.

He was the airman who performed the service described in a recent official communication, as follows: "One of our pilots, in the course of a stirring flight, brought down an aviator, who fell between our lines at Suippes." It was nearly a week before the world learned that it was the winner of the grand prix for 2 years who had accomplished this feat. At one time he was surrounded by a regiment of German soldiers, and escaped death by riding through them at high speed. Once he crossed France in a single day.

Benefit Race at Ascot

Actors' Fund Will Get Proceeds of Meet on Memorial Day

Film Stars Will Take Part in Unique Speed Events

LOS ANGELES, Cal., May 19—The Actors' Fund race meet which will be held at the Ascot speedway on May 30, will be one of the most interesting and unique speed events staged in southern California in recent years. Every well-known film star in this part of the country will take part in some of the events, which will include not only motor car races but also as many other features as a five-ring circus.

There will be motorcycle races, grudge races between film stars, specially staged motion-picture comedies, and a motorcar fashion show in which all the popular film beauties will participate. A committee of judges will pick out the most stylish turnout. The appearance of the car and the driver and the driver's ability to handle the car will all be taken into consideration. The judges, however, will not choose the winner themselves but will award the prize to the car and driver which elicit the greatest amount of applause from the public when, one by one, the cars drive past the grandstand.

One of the funniest events of the day will be the race for old cars. The Keystone company is building a picture around this event, which no doubt will give rise to

Racing Events

*May 30—Indianapolis speedway race.
*May 30—Tacoma, Wash., speedway race.
May 30—Minneapolis, Minn., speedway race.
May 30—Track meet, Elmira, N. Y.
*June 4—30-mile race, Sheepshead Bay speedway.
*June 10—Chicago speedway race.
*June 20—100-mile race, Galesburg, Ill.
June 23-24—Interclub reliability run, Chicago.
June 26—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
*July 4—Track meet, Coeur d'Alene, Ida.
July 4—Road race, Visalia, Cal.
July 4—Track meet, Elmira, N. Y.
July 15—Omaha, Neb., speedway race.
July 15—Track meet, North Yakima, Wash.
July—100-mile track meet, Burlington, Ia.
August 5—Tacoma, Wash., speedway races.
*August 11-12—Hillclimb, Pike's Peak, Colo.
August 12—Track meet, Portland, Ore.
August 18-19—Elgin road race.
August 26—100-mile track meet, Kalamazoo, Mich.
September 4—Track meet, Elmira, N. Y.
September 4—Indianapolis speedway race.
September 4—Des Moines, Ia., speedway race.
September 4-5—Track meet, Spokane, Wash.
September 16—Speedway race, Providence, R. I.
September 29—Track meet, Trenton, N. J.
September 30—New York, Sheepshead Bay speedway race.
October 7—Philadelphia speedway race.
October 7—Omaha speedway race.
October 14—Chicago speedway race.
October 19—Indianapolis speedway race.
October 21—Track meet, Kalamazoo, Mich.

* Sanctioned by A. A. A.

much comedy of an impromptu character.

Chairman Richard Kennerdell, of the Contest Board of the American Automobile Association, has informed the committee in charge of the meet that the A. A. A. will grant a special sanction for the event free of charge, since the proceeds of the meet are to go to the Actors' fund.

All the contestants must be registered with the A. A. A. The drivers in the speed events will be registered in the amateur class and those competing in the comedy races are to be given emergency drivers' cards, which will be good for this one day only.

BUICK TAKES TROPHY

Los Angeles, Cal., May 17—Joe Nikrent, driving a Buick touring car, established another road record today and won the famous Fernando Nelson cup, the oldest inter-city record trophy in California. Nikrent drove the Buick six from San Francisco to Los Angeles in 12 hours 47 minutes 50 seconds over the coast route. Two weeks ago Nikrent, with the same car, established a new record for the run between the two cities, over the Inland route, but the Fernando Nelson trophy is offered for the best time on Coast road.

Before a car is allowed to start for the Nelson cup, the donor must first make a technical examination and again just before the start, the car is examined. Since this record was made it was beaten, as told on page 18.

Race Entries to Date

INDIANAPOLIS, MAY 30

Distance, 300 miles — Purse, $30,000

Driver	Car
Christiaens	Sunbeam
Rickenbacher	Maxwell
Henderson	Maxwell
Louis Chevrolet	Frontenac
Arthur Chevrolet	Frontenac
Gaston Chevrolet	Frontenac
O'Donnell	Deusenberg
D'Alene	Deusenberg
Milton	Deusenberg
Ostweg	Ostweg Special
Mulford	Peugeot
Oldfield	Delage
DuChesneau	DuChesneau
Rooney	Premier
Stillman	Premier
Gil Anderson	Premier
Merz	Peugeot
Aiken	Peugeot
Resta	Peugeot
De Vigne	Delage
Lecain	Delage
G. Bergdoll	Erwin
Stecher	Erwin
Chandler	Crawford
Davis	Crawford
Art Johnson	Crawford
Milton	Deusenberg
Franchi	Sunbeam
Alley	Ogren Special

CHICAGO, JUNE 10

Distance, 300 miles — Purse, $30,000

Driver	Car
Christiaens	Sunbeam
Franchi	Pu Sun
O'Donnell	Duesenberg
D'Alene	Duesenberg
Milton	Deusenberg
Alley	Ogren Special
Resta	Peugeot
Oldfield	Delage
De Palma	Mercedes
Vail	Hudson
Newgard	Duesenberg
Adams	Adams Special
DeVigne	Delage
Le Cain	Delage
Not Named	Delage
Chandler	Crawford
Davis	Crawford
Johnson	Crawford

New Cross-Country Mark

Bobby Hammond Drives Empire Car from Coast to Coast in Record Time

Makes San Francisco-New York Trip in 6 Days, 10 Hours, 45 Minutes

NEW YORK, May 23—Special telegram—An Empire stock car arrived in this city today after making a record trip across the country of 3,184 miles in 6 days, 10 hours and 45 minutes. Bobby Hammond drove the car. He left San Francisco May 17 and followed the Lincoln highway through Oakland, Ogden, Omaha, Ft. Wayne, Ind., Lima, O., and Pittsburgh to New York. His longest continuous run was between Frisco and Ogden, a distance of 917 miles, which he made in 36 hours. He arrived at Omaha May 20 after a run of 700 miles in 17 hours, reaching Elkhart late Saturday evening, where he had his first rest of 10 hours. Horseshoe tires were used and only one was changed. Other equipment included Bales puncture plugger, Prest-O-Lite tank, Stewart-Warner speedometer and vacuum feed, Rex spark plugs, Pyrene fire extinguisher and Auto-Lite electric system.

PIONEER EUROPEAN DRIVER DEAD

Paris, May 10—De La Touloubre, pioneer race driver and first man to take an armored car into battle, died in Paris this week, after having been partially paralyzed and dumb for 3 years. De La Touloubre was a prominent figure in all European road races from 1900 to 1908. An artillery captain in the French army, he had adopted the name of De La Touloubre for racing purposes only, his real name being Henri Genty. In the early days he was a member of the Darracq team together with Hemery and Wagner. He won his first important long-distance race on a Darracq light car in the Belgian Ardennes in 1904. Later he linked up with the Bayard-Clement team and had the late Albert Clement as one of his companion drivers.

De La Touloubre's most important work was the organization of an armored car corps which took part in the Moroccan campaign of 1907 and following years. As an expert motorist he had brought before the war department the services gun carrying cars could render in operations against savage tribes. In 1907 the French Minister of War gave him a special mission to organize such a corps and he went out to Morocco with a number of armor plated gun-carrying Panhard cars. This is doubtless the first use ever made of armored cars in actual warfare. As a soldier De La Touloubre displayed all the dash and "get there first" ideas which had characterized him as a race driver. His armored cars were recognized to have rendered valuable service, but the campaign left him a physical wreck. While chasing the enemy the car he was driving fell down the El Kantara gorge. For a time De La Touloubre's life was in danger, but he recovered only to spend the last three years of his existence partially paralyzed and without the use of his voice.

PLAN HIGHWAY RELAY RACE

Aberdeen, S. D., May 20—The Yellowstone Trail Association has issued a challenge to the Lincoln Highway Association for a night and a day transcontinental motor car relay race to be held this summer, the running to be made simultaneously and the route over which a message starting at the Atlantic coast is delivered at the Pacific coast the quickest, to win.

SPECIAL CAR COLORS CRITICIZED

St. Louis, Mo.—Editor Motor Age—The ordering of special colors for motor cars is a bad habit that many car buyers have acquired through the desire of the salesman to use the freak color as an added talking point. Customers often have a notion that they prefer a certain color. They see a panel finished in the color and they imagine they like it. Frequently, when the car comes, the color does not please because the color seems to be too extreme.

Ordering special colors always means a delay in shipments and therefore disappointment and explanations. When the special colors are rushed through it is impossible to get as good a job as with the standard colors.

Moreover, the standard colors are going through regularly. They are not rushed. The slow, careful handling results in a better finish and a pleased customer.

More and more people are beginning to take the advice of the motor car salesman in this respect, and if more salesmen would talk standard colors, it would mean smoother and better business.—R. L. Cleveland, Superintendent Moon Motor Car Co.

SCORES CURB PUMPS

Washington, D. C., May 23—Special Telegram—Accuracy of oil pumps, such as are widely used for delivery of gasoline in 5 and 10 gallon quantities to motorists was the subject of a paper read at the eleventh annual conference on federal weights and measures today. F. J. Schlink, bureau of standards, who presented the paper, has made exhaustive tests of such pumps in several parts of the country, and in his paper related results of these investigations, which disclosed the fact that persons buying gas from the pumps would better have it drawn into measured receptacles rather than directly into the tank.

Say Gasoline Cost Is Cue for Electric Car Competition

Speakers Before Annual Meeting of Electric Light Association Talk for Quantity Production

CHICAGO, May 24—The former Electric Vehicle Association of America, now the electrical vehicle section of the National Electric Light Association, is holding its first joint session with the parent body at the Auditorium and Congress hotels, Chicago, this week. The sessions of the electrical vehicle section take place on Wednesday and Thursday. Simultaneously with the convention sessions, an exhibit is staged in the foyer and over a sub-flooring of the Auditorium theater. Several truck and pleasure car makers and car equipment manufacturers of all kinds presented attractive booths. There were about sixty exhibits in all.

The Walker Vehicle Co., of Chicago, displayed a 1-ton chassis and a Walker balance drive exhibit unit opened to show the principle of the motor inclosed in the rear axle housing driving through spur-gears within the wheels. The General Vehicle Co., Inc., also showed a truck chassis. A chassis and a delivery car were in the booth of the Ward Motor Vehicle Co. Edison batteries were equipped in both. The only pleasure car display was that of the Detroit Electric Co., which consisted of two handsomely appointed coupes.

Electric Efficiency

THE present unusual opportunity for quantity production of electric passenger and commercial cars in competition with gasoline cars, due in a measure to the great strides in electric car perfection of the past 3 or 4 years, but especially to the now high and constantly soaring price of gasoline, was the subject upon which a majority of the section and committee reports and individual papers of the meetings were founded. In his paper on "Electric Passenger Vehicle Problems and Activities," E. P. Chalfant summed up the reason for failure of the electric car manufacturers to establish themselves on a competitive plane with gasoline car makers as follows:

"The first reason is the failure of the manufacturers to properly educate the general public regarding the wonderful utility of the electric.

"The second reason is the failure of the central station to make it easy to own and operate the electric by an adequate distribution of charging and boosting stations."

He makes the assertion that the gasoline car is but 5 per cent fore efficient than the electric and attributes this 5 per cent to surplus with reference to power, radius, speed, energy and fuel.

"There was a time," said Mr. Chalfant, "when gasoline cost but 10 cents a gallon. About that same time it required about 10 hours to recharge to cells of an electric, at an average of 8 cents per kilowatt hour for current. Since then gasoline has advanced in most localities to a price above 30 cents a gallon and it is said to be on its way to 50, while electric juice has declined to an average of 5 cents per kilowatt hour. Today the constant potential charging system will bring the battery up to two-thirds of its capacity in an hour and a half—a lunch-time boost for instance—while a full charge requires but 3 hours. The ordinary charging station requires about 6 hours, and the motor generator set or the mercury arc rectifier installed in a private garage requires but little more.

The cost of power comparative between gasoline and electric cars was outlined by Mr. Chalfant as follows:

"Placing the daily mileage of each type at the conservative figure of 35 miles a day—1,000 miles a month—statistics show that current for electric averages $8.50 per month. Let us assume that an enclosed gas car, with six-cylinder motor of average power rating, consumes gasoline at the rate of 8 miles to the gallon (the average is considerably lower) at a cost of 30 cents per gallon and the expense for the month is $37.50, over four times the cost of current. Nor does it take into account the same proportionate expense for oils, greases and general repairs.

"The electric requires no chauffeur. This practically eliminates joy riding with its attendant expense. Its moderate speed prevents road abuses, doubles the life of the car, cuts tire and repair bills in half, and creates a lower percentage for depreciation. There is an absence of noise and vibration from the motor. The gasoline motor requires almost daily attention and adjustment. The owner of an electric does not see its motor from one end of the year to another. The gas car has many exposed levers—parts that are dirty and oily; the electric has none. The enclosed gas car is insufferably hot from the motor and exhaust pipe in the summer; the electric is scientifically ventilated and is absolutely free from heat, smoke odors and power transmission noises. It does not require anti-freezing compounds in winter, has no balky self-starter to irritate you in cold weather, has only about 15 per cent of the electrical apparatus and wiring that is equipped to the modern gas car, creates no nervous disorders, and can be safely driven by any member of the family over 14 years of age. There is but little to learn and less to watch, and danger is practically eliminated," said the speaker.

The above is the message he claimed that the electric car manufacturers have failed to convey to the public. Co-operation of central stations with electric car manufacturers is, in Mr. Chalfant's opinion, a means to an end in eventually bringing about charging methods which will equal or nearly equal the service now available to gas car owners in procuring fuel from gasoline stations and garages.

Central Stations

THIS argument was strengthened in the paper given by William P. Kennedy entitled "Central Station Promotion of Electric Vehicle Use." His plan embodies a battery service system added to the present power service and lighting service of central station organizations, the principal function of which would be to supply energy and maintain this type of energy-consuming apparatus in working condition; in a somewhat similar but larger way than the methods now employed to maintain lamp equipment, or the several other types of devices which are supervised in such a way as to insure to the central station that they continually remain in condition to consume its energy supply. The practicability of such a plan, according to Mr. Kennedy, lies in the fact that the existing volume of business of any central station could be doubled by securing to it the total of this electric vehicle service load available in its district. In this regard he said:

"There may be some few exceptions to this in the case of companies supplying railway power, but even in these cases the very superior return which can be secured, per unit of energy sold, for electric vehicle service, should make this field even more attractive than the railway load field. Two other pertinent points are worth considering and these are the facts that no additional investment is required for power plant equipment, and that once this load is secured upon the lines it will permanently remain there, yielding revenue from year to year, and is likely to increase rather than decrease with the development and progress of each respective community.

Mr. Kennedy used the prospective supplanting of horse vehicles by electric commercial cars as a factor to demonstrate the probability of such a system. He said:

"The total load to be thus secured is of enormous value. In several of the larger cities this would range between 50,000,000 and 100,000,000 kilowatt hours per annum, making due allowance for only a reasonable proportion of the total con-

version as a maximum possibility. If the sale of this energy is coupled with the sale of an attendant service, such as the maintenance of the apparatus proposed, there is no reason why the rate for the combined service should not include, as one of its silent factors, a rate of 4 cents per kilowatt hour for energy, which is about the figure agreed upon by most of the users of groups of these vehicles as a fair representation of their present cost."

Battery Service

P. D. WAGONER'S paper on "Battery Service—a Unit in a Comprehensive Plan for the Successful Exploitation of the Electric Vehicle," details the use of duplicate batteries in commercial vehicles which is being successfully carried out in a large way in such cities as Hartford, Spokane, Boston, Baltimore, Harrisburg, San Francisco, Los Angeles, Worcester, Fall River, and Wichita. The system, as now practiced, on the Geveco Trucking system calls for sale to the purchaser of a car less battery, the battery being supplied with a specially designed, detachable battery cradle. By the use of this interchangeable cradle the company furnishing power is enabled to exchange a discharged or partly discharged battery for a fully discharged one in from two to five minutes. The current used is sold by the mile, according to the size of the vehicle and amount of mileage used as recorded by the odometer.

Advantage is claimed in that the owner can, from tables, be shown in advance the exact cost in detail for the operation of a vehicle per month and per mile with all the principal items definitely fixed. An example is given in the use of the system in Hartford. There, of the customers who have purchased vehicles under the battery service system, 63 per cent have so purchased to replace gasoline vehicles, and the purchasers have stated that they would not consider returning to the use of gasoline machines. A glance at the records of twelve vehicles on the system in Hartford discloses that an average of from 1,000 to 1,100 miles per vehicle per month is no uncommon thing, and from the central station's standpoint they are selling approximately 600,000 kilowatt hours of off-peak A. C. primary current per year.

Garage Service

THE paper on "Greater Garage Service," by Harry Salvat was a plea for more unity than now exists between the electric car manufacturer and garage owner. From personal observation he came of the opinion that existing methods of service from manufacturers to owners tended to dissatisfy rather than enthuse them over their purchase. Factory inspection reports to owners of cars cared for by garages, in practically every instance, according to Mr. Salvat, tend to prejudice owners against the garages, inasmuch as the reports from the factory of repairs necessary to cars and often of supposed negligence of the parties who care for the cars bring about denials when presented to the garages, and often justly, which necessarily gives the owners the opinion that they not only are subject to improper service but, due to the bewildering inspection reports, are the owners of a delicate piece of mechanism which could well be replaced by a less troublesome gasoline car.

The following statement appeared in Mr. Salvat's paper: "Ninety per cent of the electric garages which have gone out of the electric business were forced out simply because they could get no support from the manufacturers. It is entirely up to the manufacturer to regulate these conditions. Their contracts with their agents should stipulate that tires, batteries, etc., should not be handled or sold by them to car owners who keep their cars in public garages. Also that if the garages do not happen to handle supplies of any kind, a tire or battery sold should be billed through said garage so that in that way the garage man could make his share of the profit just the same."

Truck Troubles

F. E. WHITNEY'S paper entitled "Electric Truck Troubles and Means Taken to Eliminate Them," was an outline of the various troubles brought to light in the early electric vehicles and the remedies devised to eliminate them. He strikes still another angle on the battery service idea, carrying the service to the car owner instead of requiring him to store his car each night at the charging station. This, in the opinion of the speaker, could be brought about through the installation of charging plugs in private garages regulated by a central station or individual company.

Comparisons between the serviceability and resiliency of solid rubber, fabric tread and cord tires comprised a major part of the paper delivered by S. V. Norton, manager truck tire sales, of the B. F. Goodrich Co. In speaking of the cord tire for electric use he said:

"Tests have proved that this tire effects a saving of very nearly 20 per cent in comparison with a fabric tire operated under the same conditions. In first cost it is not excessive and makes up for that in increased durability. In promoting the upkeep of the car it is ideal. In speed it is ideal. With the increasing power of the electric pleasure vehicles, and the growing disposition to regard it as a man's car as well as a woman's, the factor of speed becomes of prime importance. The cord tire, with its flexible construction, offers the least resistance to road obstructions, and unquestionably enables the driver to get the maximum speed efficiency from his motor."

The report of the Toronto electric vehicle section was particularly interesting in that it showed the effect of the war on car sales in Canadian territory.

"Canada is a young but vast country, with a population of only eight million, and consequently an enormous amount of new capital is constantly required to develop its almost unlimited resources. Needless to say this capital is not at present available when Canada, as a colonly of the British Empire, is in the throes of an awful conflict.

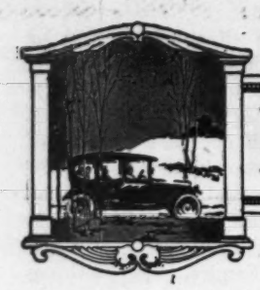
"The competition with gas cars is becoming more strenuous every month on account of the increased manufacturing facilities and resultant low production cost of gas trucks, which advantage has been brought about through the enormous orders for gasoline vehicles placed by the allied nations at war.

"The increase in the value of horses, feed, cost of wagons, harness and stabling has resulted in a decided advance in the cost of maintaining the horse delivery system, and in the writer's opinion this should cause a much greater demand for the light delivery electric. This is a field that should be developed, more especially as there are indications that the small gas car has reached its lowest price, and further, that gasoline, oil and repairs must necessarily cost a great deal more per mile in the near future than at the present."

From data available, the traffic and good roads committee reported that the most efficient pavement is one constructed of asphalt, wood blocks, or tar macadam; that a brick pavement, well grouted with cement, is somewhat less efficient; that a stone block pavement, well grouted with cement is less efficient than a brick pavement; and that a stone block pavement with crevices filled with sand is still less efficient. Also that roadways in poor condition require from 50 to 100 per cent more power to drive a motor vehicle over them, and that asphalt pavements covered with compact snow and ice indicate that they require from 50 to 100 per cent more power, and when covered with loose snow even additional power is required. Tables compiled from periodical inspections of all natures of paving substantiated the conclusion as to the best material.

GEORGIA LEADS IN CONVICT WORK

New York, May 19—The national good roads board of the A. A. A. has released an article for the National Committee on prisons showing the progress in road construction by convict labor in the state of Georgia. That state has developed convict road work to a greater extent than any other. A report submitted to the national prisons committee by Judge George T. Cann, of Savannah, Ga., states that 6,147 prisoners were at work on Georgia highways June 1, 1915. The state prison commission has supervision over all felony and misdemeanor prisoners. The commission distributes the labor under a system which gives the control of the work to the counties.



EDITORIAL PERSPECTIVES

Amateur Racing Meets

THOSE who were privileged to see the amateur race meet at Chicago had it brought home to them, and rather forcibly, too, that even though their thrill-craving desires may hunger for the professional race, the rakish mounts with speed possibilities of far in excess of 100 miles per hour, and the professional driver, there is just as much real sport in amateur meets, although this may be due partially to the interest bred of home talent. Even the hardened race fan who must see blood spilled and cars wrecked in professional meets before he feels he has had the worth of the dollars he gave up for the admission pasteboards, had to admit that the Western Interclub Trophy race was something different from that to which he was accustomed.

NOTWITHSTANDING the battle between sun and rain, with the latter the victor on the first day and taking the offensive on the second for a good part of the time, the attendance should have given the speedway management a good idea as to the financial possibilities of holding other amateur meets at regular intervals. Such events proved the salvation of the Brooklands track and made it a financial asset instead of a liability. So greatly did the events of the English course attract that meets were held every fortnight until Mars put a ban on sporting attractions and the Brooklands speedway was turned into a military testing field.

THE speed shown by the drivers in the Chicago race was never even closely approached on the Brooklands track in the meets that became a fixture there up to 1914. Every speedway in the United States would do well to institute a series of such amateur races at regular intervals. Not only would it be a good thing for the sport but from a financial viewpoint, the various speedway managements ought to look with favor on these events. One thing, however, should not be forgotten: The admission prices for these events should not be placed on a parity with those governing the big meets where big cash prizes are offered. The real sportsman does not care for money; he would much rather get a trophy for winning.

WITH present-day speedways having a capacity for accommodating upwards of 100,000, there should be no difficulty in drawing 50,000 or more persons to these meets. A baseball team can get 35,000 to 40,000 at 50 cents a person, why shouldn't an amateur racing meet do as well, if not better? Let the bars down and make general admission 50 cents. Thousands of our city population can afford and gladly would give up 50 cents to witness such a meet as the one on the Chicago speedway last Saturday and Sunday, while the $2.50 for a grandstand seat kept many thousands away. One is inclined to think it would be much better for the speedway from a financial viewpoint to get 50,000 persons at 50 cents apiece than to get the few thousand it did at $2.50 each. Furthermore, it would be a greater asset to the sport in general and make for the permanency of these meets at regular intervals. Who'll take the initiative?

IN THE foregoing paragraph, sight has not been lost of the fact that the investment in modern speedways is not comparable to that of baseball parks, but the simile is used to show that sporting events are better patronized when the admission price is low than are those in which a high fee is charged. It seems logical to suppose that with the keen interest in motor cars, both by owners and non-owners, might be commercialized to a greater extent if the gate fee more nearly fit the purse of the multitude than the purse of the few.

Lessons From Racing

THE first race on the Indianapolis motor speedway, the dean of them all, was held in August, 1909. It was a 300-mile event. Others have been run every succeeding year, ranging from 1-mile events up to 500 miles and have attracted the finest creations of Europe to invade America and exert every possible effort to wrest the speed laurels. Europe it must be admitted, has had its lion's share of success too, although a few American-made cars have held their own stubbornly. Following the Indianapolis example—other cities have built speedways, two of which got on the front pages prominently last year, one at Chicago and one at New York.

SPEED spells safety—it means a car that endures the abnormal strain, vibration and wear imposed at sustained speed will live longer when in daily routine, private-owner service. It means that racing has inspired the industry, has found the mistakes in mechanical construction and, in fact, the race track has been the laboratory where experiments were made and the analytical secrets discovered. We may not believe in racing—but we must believe in what it has done and still is doing. You may own a car of a make that was never in a race—but chances are ten to one that the steering knuckle on your car is safe because of what racing taught some other maker about steering knuckles.

The Speedway Classic

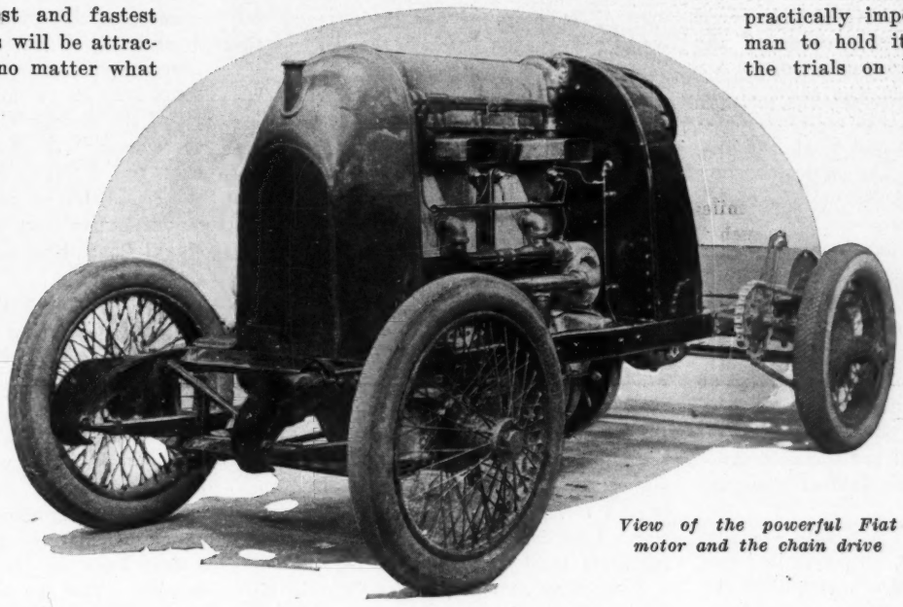
THERE are three things that recommend the Indianapolis race to the enthusiasts the nation over. First, the Indianapolis track is an institution. It was the pattern and the inspiration for all others. Second, a race at Indianapolis dominates. It overshadows everything else in the state on that day. It is an event, an occasion, a great get-together that thrills, entertains and instructs. It has become the Memorial day classic for motor enthusiasts.

THE third reason is that the driver element plays such an important part in the Indianapolis race. There is no monotony, or procession of cars, in set order for mile after mile. In every race held at Indianapolis it has been chuck full of shifting oppositions and breath-taking climaxes. The driver cannot lock his wheel, as it were, and let his car do the racing. He must drive, using his head every second of the way. Even if other speedways may make a little faster time than is going to be made at Indianapolis, no speedway can offer the elements that go to make up existing competitions that the Indianapolis speedway offers, and that is the kind of race that the spectators want to see. Mere speed has interest, but not the compelling power of skill shown in negotiating a track whose turns are not banked for the maximum.

World's Biggest and Fastest Car Always Attractive

Giant Fiat Which Duray Drove at 142.9 Miles Per Hour at Ostend Is Supreme

THE world's biggest and fastest racing car always will be attractive to the motorist, no matter what his personal views may be on practicability and economy. Fiat holds the record for both size and speed with a 300-horsepower car which was driven by Duray at Ostend, Belgium, at a speed of 142.9 miles an hour. This racing freak has a four-cylinder motor of 7.48 inches by 10.4 inches bore and stroke, giving a piston displacement of 1,828 cubic inches. The car was built to the order of a Russian prince, and was first driven by Nazzaro. The ambition of the prince was to break the world's straightaway record, and with this object in view he sent Arthur Duray and the car to Ostend in November, 1913.



View of the powerful Fiat motor and the chain drive

The Italian car was officially timed on several occasions to cover the kilometer at a fraction more than 142 miles an hour. But in order to satisfy the European regulations the run had to be in both directions within a quarter of an hour. Owing to variable weather conditions—wind from the sea, sand blowing in from the shore, rain, etc.—Duray could never make the two trips within the time allowance. Thus, although his speed was never doubted, his performance never was given official European recognition.

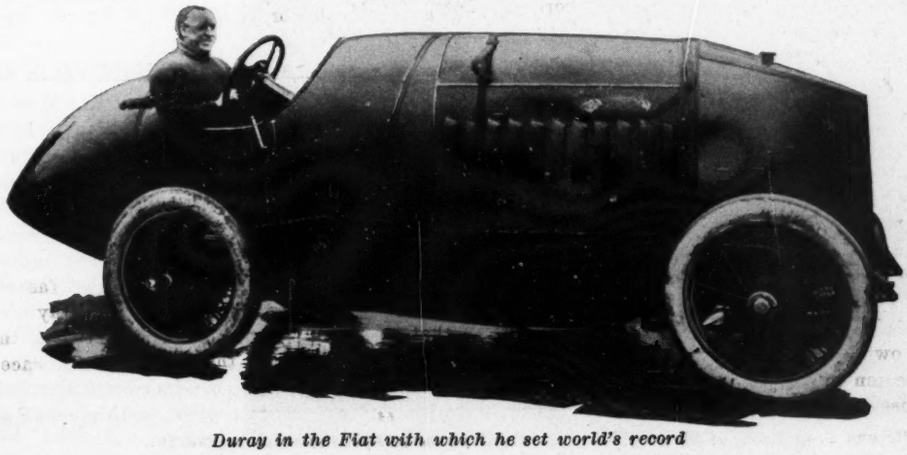
This giant Fiat has its four cylinders cast in one block, with valves mounted in the head and driven by an overhead camshaft concealed under an aluminum housing, this arrangement tending to increase the height of the motor, which stands more than 5 feet from the ground. The vertical shaft driving the overhead camshaft is at the rear of the group of cylinders, while the water pump and magneto are respectively to left and right of the casting and driven off a cross shaft. Despite its size, the motor is a remarkably clean design; its hood fits around it as closely as a suit of clothes made to measure. The drive is taken through a three-speed gearbox, jackshaft and side chains to the rear wheels. This car has seen very little road service. When it was submitted to the French authorities, it was refused the technical license without which no car can be driven over French roads. At the present time it is in cold storage at the Fiat factory.

Although the 300 horsepower Fiat has been the most spectacular of big cars, it has to take second place in matter of size to a 350 horsepower Fiat with which Nazzaro made some demonstrations on Brooklands track 3 or 4 years ago. The engine in this case had a bore and stroke of 9.4 by 12.6 inches, giving a cylinder capacity of 3,498 cubic inches. It was estimated that this car would show a speed of 155 miles an hour, but as events proved, it was practically impossible for any single man to hold it to the road. After the trials on Brooklands track the car was returned to the factory, the motor eventually serving aboard a racing boat.

Benz has been responsible for some very big racing motors, the most successful of which was a machine of 7.87 by 9.8 inches bore and stroke, giving 1,913 cubic inches piston displacement. This car climbed Gaillon hill, near Paris, 1 kilometer in length, with an average gradient of 8 per cent, at an average of 101.5 miles an hour, thus creating a record which remains unbeaten.

The biggest Fiat long-distance road racer ever built was the machine with which the late David Bruce Brown took part in the French grand prix at Dieppe, in 1912. These cars had four-cylinder motors of 6.1 by 7.87 inches bore and stroke, giving 920 inches piston displacement. They were defeated by the Peugeots of only 447 cubic inches, this being the biggest racing car ever built by the French firm. It was this same Peugeot car which won the 1913 race at Indianapolis, Goux driving.

There are indications that for record-breaking stunts, and for the publicity which they secure, the building of big freak cars will be continued. Nevertheless, for competition work on road and track the whole tendency is towards smaller and smaller engines. An example of this is shown in the case of Peugeot, whose biggest racing car only cubed 447 inches, and was barely capable of 100 miles an hour. A smaller car of 275 cubic inches piston displacement showed a speed of 110 miles an hour; the smallest car, built just before the outbreak of war, has not yet been seen in public.



Duray in the Fiat with which he set world's record

Discuss Armored Cars and Trucks

United States Has Much to Learn About Vehicle Preparedness

NEW YORK, May 19—Armored cars and trucks were the chief topic of discussion at the May meeting of the Metropolitan Section of the Society of Automobile Engineers held Thursday, at the service station of the International Motor Co., Sixty-fourth street and West End avenue, New York City. The subject of preparedness and the Automobile Reserve Corps was also discussed.

The United States has much to learn about motor truck preparedness from England, it developed from the addresses made by Captain Kilburn, who attended as the representative of Major General Leonard Wood, commander of the department of the east, U. S. army and of Mr. Murden, who is in this country purchasing war material and who has had considerable practical experience with mechanical transport in the present war.

Showing the need for adequate preparation of motor transport equipment in times of peace Captain Kilburn stated that the Mexican expedition of our army had been held up for 6 days because of the lack of motor trucks for the transport of troops and their supplies. He stated that had plentiful supplies of motor trucks been available the troops could have started in pursuit of Pancho Villa without delay and that by now the trouble probably would have been all over.

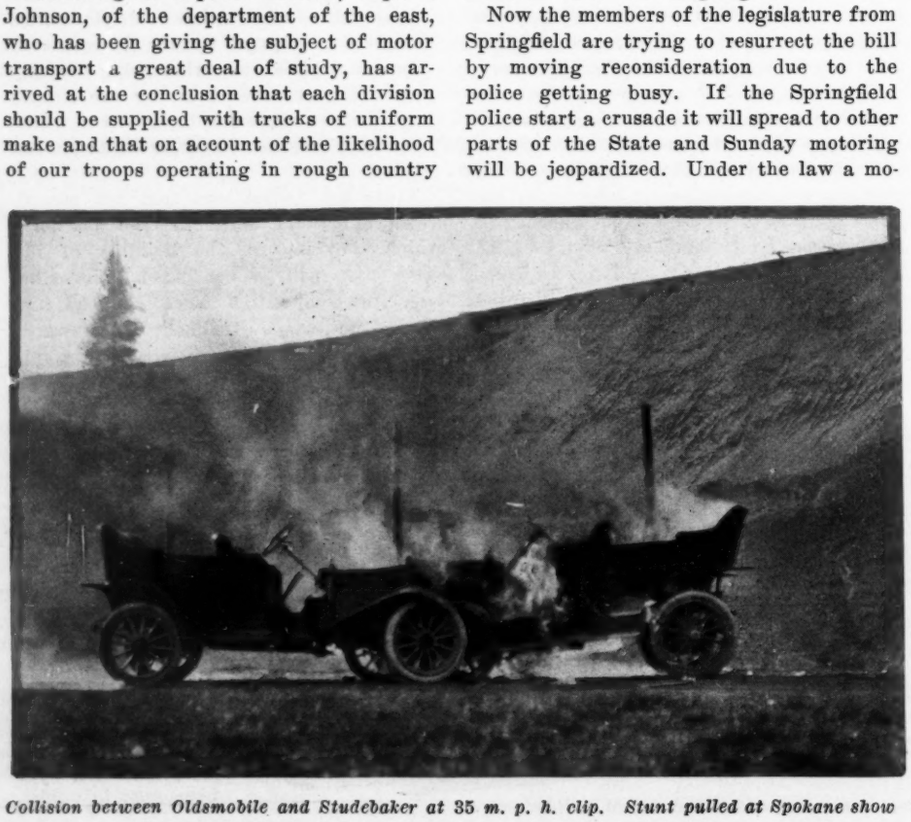
According to Captain Kilburn, Captain Johnson, of the department of the east, who has been giving the subject of motor transport a great deal of study, has arrived at the conclusion that each division should be supplied with trucks of uniform make and that on account of the likelihood of our troops operating in rough country and also on account of the limited supporting capacity of our bridges and culverts the 1½-ton truck is regarded as the maximum size practicable.

That the new Automobile Reserve corps law now in process of passage in Congress will permit the President to appoint any volunteer men or bodies of men to serve the army in case of need in the quartermaster department of the army was an interesting point brought out by Captain Kilburn, who also stated that this law would place no limits on numbers of such appointments.

Captain Kilburn emphasized the importance of organizing a large and efficient reserve of commercial vehicles available for service in case of war. He also urged the advisability of standardizing on given makes for each division. He stated that in the formation of the reserve corps, it was his opinion that the motor truck manufacturers must do the recruiting.

Respecting armored trucks Captain Kilburn was sceptical as to their value inasmuch as they are dependent upon roads for operation and can very quickly be put out of action by well-directed artillery fire as they constitute excellent targets. He stated that up to the present, such armored cars as have been experimented with in this country have been equipped with machine guns but that more effective work could be done with larger guns.

Now the members of the legislature from Springfield are trying to resurrect the bill by moving reconsideration due to the police getting busy. If the Springfield police start a crusade it will spread to other parts of the State and Sunday motoring will be jeopardized. Under the law a motorist cannot buy gasoline, tires, etc., and if he runs short of fuel and has a couple of punctures and has not extra tubes he may be marooned in a garage all night. The only alternative would be to borrow a tube or some fuel from a passing motorist.



Collision between Oldsmobile and Studebaker at 35 m. p. h. clip. Stunt pulled at Spokane show

HOOSIER S. A. E. PLANS DINNER

Indianapolis, Ind., May 20.—The Indiana section of the Society of Automobile Engineers will give a dinner Monday evening, May 29, to the members of the council of the society. The chief discussion of the evening will be on Industrial Preparedness and Howard E. Coffin, chairman of the committee on production, organization, manufacturer and standardization of the Naval Consulting board, will be the chief speaker.

This banquet will mark the closing of the 1915-16 meeting of the Indiana section.

DONATES MODEL FIELD AMBULANCE

Wilmington, Del., May 22.—As the result of a campaign which has been carried on in this city for the collection of funds to aid in French army relief, a model field ambulance has just been completed in this city and will be shipped in a few days on its humane and worthy mission. The car was built by the Wilmington Automobile Co. and is an example of high-class work. It is mounted on a Buick chassis; has heavy-duty tires, and all parts of the sub-construction are suitable for the strenuous service it undoubtedly will undergo. The sides of the car are built solid for about half their height, and the remainder is of open windows, fitted with heavy screening. Curtains of canvas hang on the sides, rear and just behind the driver's seat. On each curtain is the emblem of the Red Cross. On the right side will be carried an American Flag and on the left side a French flag.

The body is lettered with the name "American Ambulance," in honor of an organization which has been very active in soldier relief work in Northern France. It also bears on each side of the body a plate worded as follows: "Gift of Wilmington, Delaware."

The ambulance is to leave this week, under the charge of Dr. William C. Speakman of this city, who designed it and collected for its equipment.

NEW VELIE TRUCKS READY

Moline, Ill., May 19.—The Velie Motor Vehicle Co. now is delivering a 1½-2-ton and a 3½-ton truck in worm-drive types.

Model 25, as the smaller truck is known, contains a 4⅛ by 5¼-inch continental motor controlled by a gear driven centrifugal governor. The radiator tubes are removable, the whole assembly being supported on springs to relieve road shocks. The frame on the 25 is a channel steel section 5¾ inches deep, still further reinforced by a 4-inch set frame which carries the powerplant, multiple-disk clutch and four-speed gearset.

The worm-driven rear axle is floating, with Timken bearings throughout as well as in the front axle, and gearset. Furnished in two lengths of wheelbase this model adapts itself to all forms of lighter hauling.

The Model 26, or 3½-ton size, has a motor 4½ by 5½ and all other features of proportionate capacity, strength and durability are revealed in every line.

In design the two trucks are identical, except in matter of size. An interesting feature is the flexible joint between the clutch and gearset. This is made up of several leather disks bolted together, which allow ample movement, yet eliminating noise and rattle absolutely.

Velie Biltwel trucks are completely equipped with top over driver's seat, seat and cushion, gas headlights and Presto tank, oil lamps and all tools. Later in the summer an additional model will be added to the truck line, which will give a range of capacities satisfying every need, even the lighter forms of delivery.

Velie Biltwel trucks are built in an exclusive truck factory at Moline, a mile distant from the plant now operating in the production of Velie sixes.

PA. S. A. E. HOLDS PICNIC

Philadelphia, Pa., May 20—The Pennsylvania Section of the Society of Automobile Engineers held here today its first annual picnic. Thirty members from all parts of the state attended the outing to Browns Mill, N. J., a drive of 35 miles. Canoe races, quoits, bowling and baseball were the main attractions of the day.

U. S. BUYS UNIQUE TRUCKS

Bridgeport, Conn., May 19—An unusual order for trucks was placed last week with The Locomobile Co. of America, by the U. S. government, for a complete Company of thirty 3-ton Riker Trucks. The order was the first that has been awarded for anything larger than a 2-ton vehicle.

The order was placed Monday morning and was filled by the Locomobile Co. Tuesday afternoon. The trucks were loaded on a special train in Jersey City, and were shipped directly through to San Antonio, Tex. It is understood that these trucks will go into immediate service on the Mexican border.

Forty-one mechanics and drivers accompanied the trucks, on the special train consisting of engine, pullman, sleeper, diner and express cars.

This order follows a demonstration given by the Riker Truck a few days ago, when this motor truck ran from Columbus, N. M., to El Paso, Tex., over the rails of the El Paso and Southwestern railway system, and on arrival at El Paso was derailed and driven up the main street to General Scott's hotel, where the General inspected it and pronounced the test highly satisfactory. The truck left El Paso the same evening and made the return trip to Columbus, N. M., without accident.

"Should Car Manufacturers Make Parts?"

It Is Pointed Out That This Is a Case for Individual Settlement

DETROIT, May 18—In answer to the questions: Should a car manufacturer make his parts, or should he assemble them, and if he should manufacture them, what proportion should he make and which should he buy? H. M. Jewett, president of the Paige-Detroit Motor Car Co., told the large attendance at tonight's regular monthly meeting of the Detroit Section of the Society of Automobile Engineers that it is all a case of the individual conditions with each company.

Through the particular experiences and troubles each maker has encountered, each has his own ideas of what he should and should not buy from the parts makers, and there is no uniformity about it. One large producer may make some part that another concern equally as big has always purchased from a parts manufacturer, and there are so many qualifying conditions that no rules can be laid down. It is a safe prediction, however, that each maker has good and sufficient reasons for the policy he follows. There are reasons back of each move he makes.

The meeting was the first under the regime of D. McCall White, Cadillac chief engineer, who was elected chairman of the Section at the April meeting. In taking the chair for the first time, Mr. White praised the work of the retiring officers and bespoke the hearty co-operation of all in carrying on what has already been accomplished. Because all cannot avail themselves of the annual midsummer outing of the entire society, which this year takes the form of a lake trip, it has been decided to hold a family outing for the section on June 24 somewhere in the vicinity of Detroit.

That the subject of assembly versus manufacture is of great interest to manufacturers was evidenced from the fact that some of the leading factory representatives entered into the interesting discussion that followed Mr. Jewett's talk. Among the speakers were Alvan Macauley, Packard company; C. T. Meyers, Timken company; K. W. Zimmerschied, General Motors Co.; G. W. Dunham, W. A. Brush, J. W. Wright, Golden, Belknap & Swartz; J. G. Vincent, Packard company; T. P. Chase, King Company; E. V. Rippingille, Hudson company and others.

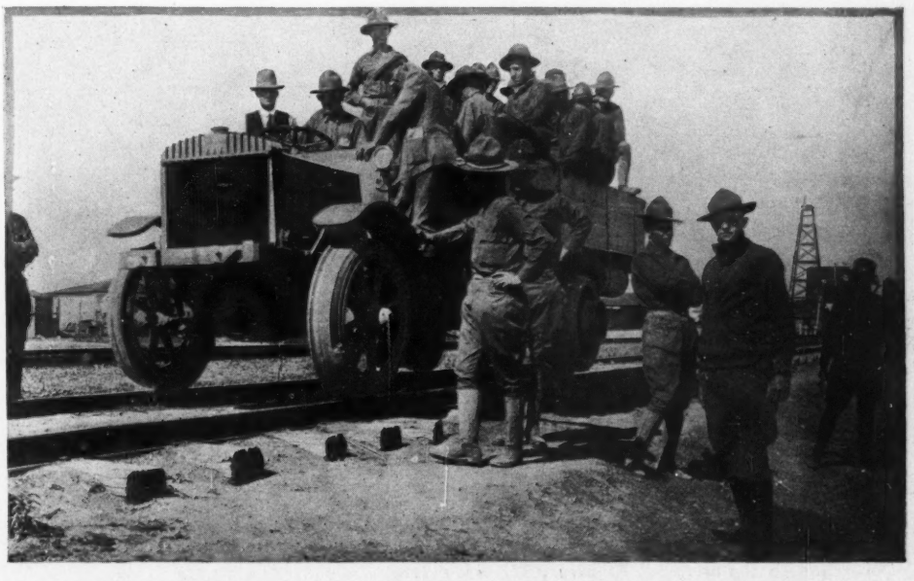
CHEVROLET IN COAST MARK

Los Angeles, Cal., May 19—R. C. Durant, driving a Chevrolet touring car and carrying three passengers besides the driver, set up a new round trip record from Los Angeles to the San Diego exposition and return, yesterday. Durant cut the time from 8 hours 10 minutes to 7 hours 55 minutes.

STRONG HEADS BUICK FORCES

Detroit, Mich., May 23—E. T. Strong, formerly manager of the Chicago branch of the Buick Motor Co., has been appointed general sales manager of the Buick organization, at Flint, Mich., to succeed R. H. Collins, resigned. Mr. Strong has been connected with the Buick organization since 1911 and previous to that was identified with the McCormick Harvesting Machine Co., and later with the International Harvester Co. Mr. Strong's first connection with the Buick company was as branch manager at Buffalo.

Mr. Collins does not officially relinquish his duties until the end of the company's fiscal year, August 1.



Riker truck with flanged wheels on track between Columbus, N. M., and El Paso, Tex.

Eighteen Entries for Chicago Race

Blanks Signed by Drivers Who Participated in New York Meet—Vail Enters Hudson

CHICAGO, May 23—Eighteen entries have been announced for the Second Annual International Auto Derby to be held at Chicago on June 10, the latest ones being the three Harkness entries, two of them Delages and the Pu-Sun, the Hudson belonging to Ira Vail, the Duesenberg owned by C. J. Devlin of Kansas City and the Adams Special, which has been entered by Adams Bros. of Brooklyn, and which is to be driven by George Adams.

One of the Delage cars will be driven by Jules De Vigne and the second one by Jack Lecain, while the Pu-Sun is to be piloted by Aldo Franchi. The Hudson Super-Six is to be handled by Vail, who drove it in the Metropolitan trophy race at Sheepshead Bay on May 13 and got third place. C. J. Devlin will give up the wheel of his Duesenberg to Barney Newgard, who acted as his mechanic in the Metropolitant trophy event. This car also won a place at New York.

Other entries said to be in the hands of the Chicago speedway, but not yet announced, include the Peugeot in which Mulford won at New York and the Maxwells driven by Rickenbacher and Henderson. There also is a rumor afloat that the car in which Bob Burman met his death at Corona, Cal., is to be campaigned this year in behalf of his widow, and the whispered conversation is that it will be among the cars in the Chicago race.

SUSPEND MARRIED MAN RULE

Chicago, May 23—Word has just come from Indianapolis that the rule which has been inforced by the Prest-O-Lite racing team and the speedway racing officials which prohibits married men from serving as race drivers or mechanics on the cars of either of the Indianapolis teams has been rescinded. When this rule was put into force it meant that a number of the drivers and mechanicians had to find other employment. One of the results of doing away with the rule is that Harry Goetz will ride with Rickenbacher. Goetz has served as mechanic for Harroun, Burman, Oldfield and Rickenbacher, and the latter wired for him immediately upon learning that he could serve.

DEMONSTRATION FIELD AT FAIR

San Diego, Cal., May 19—The first motor demonstration field ever offered by any exposition will be opened at the Panama California International Exposition at San Diego, May 20. From the opening day until the close of the exposition, December 31, special motor car events will be held on the exposition grounds, participated in by all American cars represented. At the present time forty-five cars have been granted space on the field.

Special events will be offered daily by the cars displayed; special grades have been built for hill climbing contests; a quarter-mile oval track has been installed for demonstrations and slow races.

ECONOMY RUN AT SPOKANE

Spokane, Wash., May 19.—The first economy run ever staged by Spokane dealers was the feature event of the second annual Spokane motor show. Sixteen cars competed in five classes, all the entrants showing exceptional ability to go many miles on a gallon of gasoline.

Before starting each car was fitted with a special gasoline tank, which was filled with three gallons of gasoline, and every car made the 37.5 mile run on less than the 3 gallons.

To the little Saxon goes the honor of making the best showing. With a piston displacement of less than 100 cubic inches it used just a little more than 1 gallon of gasoline, traveling at the rate of 34 miles to the gallon.

In the next class the Maxwell was the winner, averaging 29.3 miles to the gallon. The Buick six roadster led its field, averaging 26.8 miles to the gallon.

In division No. 6, the class in which there was the greatest number of entrants, the Reo four, driven by Herb Alderson, was the winner. It averaged 25.4 miles to the gallon.

C. A. Martin driving a Paige six roadster was a winner over the Studebaker in the large car class, averaging a little better than 16.5 miles to the gallon.

WESTERN PARKS OPEN

Visalia, Cal., May 18—Supervisor Walter Fry, in charge of the General Grant Park and Giant Forest, announces that permits have been issued to concessionaires to open their places of business in the national reserves June 1. Garages, camps, hotels, and general merchandise stores will be provided in both parks.

Roads to the parks are already passable and the parks are open for visitors, but autoists are advised against making the journey for the next weeks as incidental repairs on some portions of the roads are still in progress.

Fees for Giant Forest have been reduced, a motor license for a single trip now being $2 and a season permit $5 as against $5 and $25, respectively, which obtained last year. In Grant Park the fee for single trip has been reduced to 50 cents, with $2 for the season.

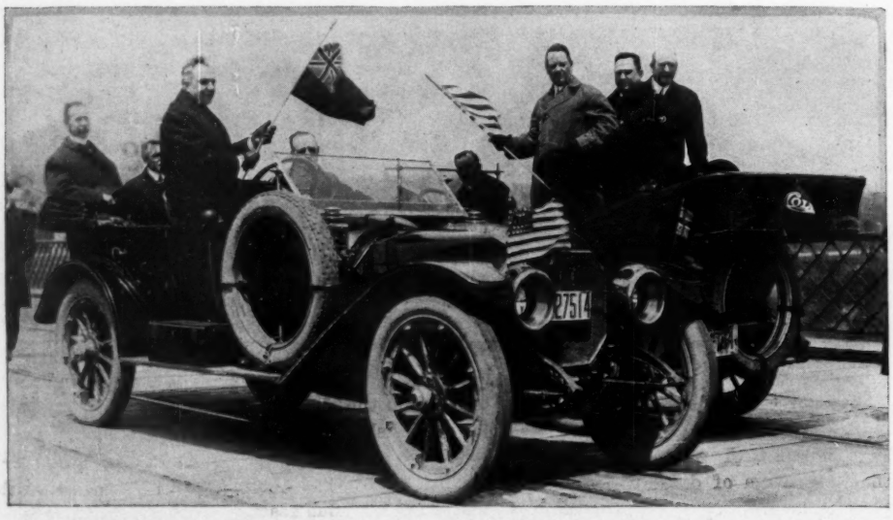
TRAILBLAZERS NEAR END

St. Paul, Minn., May 20.—Added interest in the sociability tour to start from the Twin Cities for Yellowstone park July 20 was injected yesterday by a letter from General Coleman du Pont, good roads booster of New York, that he expects to participate.

That enthusiasm along the route is rapidly taking definite form was made clear by the route-marking party now wending their way to Gardiner, Montana. In cities passed through where they have been feted they were told that more than $100,000 will be expended in highway betterment work along the route during the next two months.

After waddling around in rain-soaked roads for several days the route-markers, in a Chalmers car, last night arrived at Glendive, a few miles over the Montana lines. There they were taken in tow by members of the Dawson County club.

The trailblazers caught their first glimpse of the picturesque Yellowstone river as they entered Glendive and will



Finlay G. Macdiarmid, minister of public works and highways of Ontario (on the left), and Gustave C. Miller, deputy secretary of state of New York, bearing the American flag, inaugurating the exchange of motor licenses between the Province of Ontario and New York state on the bridge at Niagara Falls last Friday

follow it much of the way to Gardiner. The last 54 miles of the trip will be down the rock-ribbed canyon roads bordering this stream where the best scenery will be found. It is expected that the pathfinding journey will end Tuesday when the car will be immediately returned to be made ready for the trip over the same route in July.

SERVE PAPERS IN RIM SUIT

Chicago, May 19.—After 2 weeks papers have been served in the rim infringement suit of the Universal Rim Co. against the Perlman Rim Corp. through the Jackson Rim Co., its subsidiary in Jackson, Mich.

E. K. Baker, president of the Universal Rim Co., stated that his suit against the Perlman Rim Co. is not a suit against what are known as the Perlman patents, but is a suit for alleged infringement of the patents of Mr. Baker and others, owned by the Universal Rim Co. Mr. Baker says that under his patents the complete rim may be made and that the Perlman Rim Co. will be unable to make a complete rim without infringing some of the several score patents which he holds.

Under date of May 16, E. K. Baker was allowed patents on demountable rim construction and embodying thirty-six distinct claims. The application for these patents was filed last March. The drawings show the neutral plane form. Charles Gilbert Hawley, patent lawyer of Chicago, made this application for the most recent patents allowed Mr. Baker under patent No. 1,183,518, the fundamental or inclusive case by putting into it the basic claims covering all the Baker forms. All told there were many applications. Some of these remain in the patent office and will be used to cover other forms specifically. This is another way of saying that Mr. Baker has contented himself with gathering the main strings into this present patent and making it the parent or fundamental patent on the point of the single-line support.

BRING OUT TWO TRUCKS

Emigsville, Pa., May 19.—A new commercial car has been placed on the market by the Acme Wagon Co. At present the Emigsville plant is turning out the trucks in two sizes, ¾ and 1-ton capacity. The ¾-ton truck is equipped with a Wisconsin motor, Timkin roller bearings, worm-drive axle and heavy pneumatic tires. The 1-ton truck has a Continental motor, heavy duty internal gear-drive axle and solid rubber tires. Both trucks have wide frames which bring the springs close to the wheels on the axle, reducing side sway and vibration and at the same time making it extra strong and durable. The bodies for the trucks will be made up special as to the size and style to suit the purchaser and for the purposes intended. E. K. Emig is the president of the company.

Given Reciprocal License Privilege

Residents of New York and Ontario May Motor Without New Tag

BUFFALO, N. Y., May 22—At the stroke of twelve last Friday two cars moved slowly out from the American and Canadian ends of the upper steel arch bridge at Niagara Falls. In the one, which left the Canadian side, was Finlay G. Macdiarmid, minister of public works and highways of Ontario, and his party numbering other Canadian officials. In the other car was Gustave C. Miller, deputy secretary of state of New York.

The two cars proceeded to the exact center of the bridge where they stopped. Minister Macdiarmid and Deputy Miller alighted from their machines, grasped hands and exchanged cards which granted to Minister Macdiarmid touring privileges in New York state and to Deputy Miller the same privileges in the province of Ontario. This ceremony marked the opening of the reciprocal agreement between the two governments which grants the residents of New York state and the Province of Ontario the privilege of touring in either commonwealth without being compelled to buy a license as hitherto.

Many motorists from Buffalo and Western New York and from Toronto and other points in Canada participated in the ceremony. There were sight-seeing trips on both sides of the border. Despite the fact that the cars from the American side after crossing the bridge remained on the Canadian side only for a brief period every one was searched by the soldiers who are on guard at the Canadian end of the bridge. Arrangements had been made, however, so that the examinations were not too rigid.

THINKS BENZOL GOOD SUBSTITUTE

Benzol, in the opinion of Elwood Haynes, of the Haynes Automobile Co., is the most probable substitute for gasoline. "If care were taken," says Mr. Haynes, "to reclaim the benzol which goes to waste each year in the dry distillation of coal for coke, this fuel could be placed on the market at a price that would make it as economical for the automobile owner as gasoline. In past years Germany has produced the major part of the world's supply of benzol for use in her dye industries. In the United States, the residue containing benzol, which has accounted in good share for Teuton commercial prestige in past years, has been permitted to go to waste.

"The American production of Benzol, during this year, will amount to 22,000,000 gallons, most of which will be used for the production of dyes, chemicals and explosives. By wider application of the methods in present use this production could easily be raised to 600,000,000 gallons yearly.

"The reclamation of benzol from the coal that goes to waste through archaic mining methods would swell these figures to even greater amounts. If benzol comes into common use, we have no shortage to fear."

Benzol contains the same elements as gasoline, but the carbon and hydrogen are combined in equal parts. While the two liquids differ widely in their chemical actions, both are readily volatile into highly explosive gases, when properly mixed with air. The entente countries, which are now cut off from the American supply, are using benzol in their military motors without changing the design of either the motor or carbureter.

FISK STRIKE ENDS

Springfield, Mass., May 21—The striking machinists and tire workers of the Fisk Rubber Co., Chicopee Falls, Mass., have accepted the latest propositions made by the company. Twenty-six hundred men will return to work.

VANDERBILT AND GRAND PRIZE DATES

Los Angeles, Cal., May 22—The dates for the Vanderbilt Cup and International Grand Prize races at Santa Monica will be November 16 and 18, respectively.

SINGLE MOTOR-TAX BILL REPORTED

Washington, D. C., May 20.—The Adamson bill, providing that no motor car owner licensed in one state, district or territory, shall be required to take out a license or pay a motor car tax of any kind in any other state, district or territory, was ordered favorably reported today by the House Committee on Interstate and Foreign Commerce. It is expected the bill will be enacted into law within the next few weeks, as strong pressure is being brought to bear upon members to this end.

JERSEY WELCOMES MOTORISTS

Forked River, N. J., May 22.—According to President Ernest P. Napier of the New Jersey Fish and Game Commission, the state is making every effort to turn itself into a happy hunting ground, and is becoming a center of attraction for sportsmen from all over the country because of the work of restocking woods, fields and streams with all manner of game and fish from the state's own game farm, here, and its fish hatcheries at Hackettstown.

The state is a playground in summer with its hundreds of miles of seacoast and its numerous resorts, chief of which is Atlantic City, and it is trying to attract more visitors at other seasons by its various natural advantages.

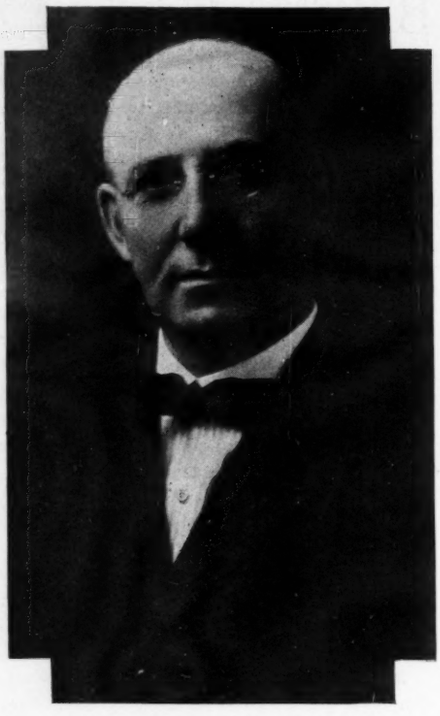
Oppose Multiple Tax at Annual Convention of A. A. A.

Delegates Draft Strong Resolutions —H. M. Rowe Elected President by 200 Members Who Attend

WASHINGTON, D. C., May 20—In its annual meeting held here May 19, with nearly 200 delegates in attendance, the American Automobile Association went on record with a resolution condemning the multiple taxation of motor-driven vehicles. The argument presented was that the motor car had demonstrated its usefulness and economy to the extent that it is now in general use in cities and towns, and in the country, employed equally by urban resident and farm-dweller, and that in several states diversified and conflicting forms of taxation are in effect which bear upon the motor car but are not similarly applied to horse-drawn vehicles. The contention was made that, where a personal tax is levied on motor driven vehicles, the registration fee should not be greater than the cost of such registration to the state.

The election of officers resulted in the choice of the following: President, Dr. H. M. Rowe, of Baltimore; vice-presidents, Ralph W. Smith, Colorado; P. J. Walker, California; H. J. Clark, Minnesota; Preston Belvin, Virginia, David Jameson, Pennsylvania; C. C. Janes, Ohio; treasurer, H. A. Bonnell, New Jersey; secretary, John N. Brooks, Connecticut. While the chairmen of the various boards have not been selected, it is understood the present chairmen will be continued in office.

The convention was brought to a close with a banquet. Dr. Rowe, president of the Automobile Club of Maryland and the A. A. A., acted as toastmaster. The first speaker was Congressman Adamson, of Georgia, author of the bill bearing his name, now before the House, providing that any motorist who has secured a license in his own state, may travel in any state in the union without taking out another license. Stephen T. Mather, Assistant Secretary of the Interior, told of the work being accomplished in the opening of national parks and the assistance being rendered by the federal government. After noting the big increase in the use of the roads of the national parks, he suggested a resolution by the American Automobile Association that the bill to establish a national park service, and for other purposes, be endorsed and recommended for early enactment into law by Congress, as being in the interest of the more efficient and economical administration and regulation of the federal areas known as national parks, monuments and reservations. He said that this year the parks would be opened about June 15, instead of August 1, as last year. With the advent of the motor vehicle in the parks, especially Yellowstone Park, he said that possibly next year the historic stage coaches would be replaced with motor-driven vehicles for the transportation of visitors.



H. M. Rowe, new A. A. A. president

Thaddeus E. Terry gave a brief review of the work of the association in legislative matters and the fight before Congress for the passage of the Adamson bill. He told of the necessity for throwing aside state lines for the tourist, saying that the good roads of the country would be of no value to the people unless they could be freely used for interstate travel. Other speakers included John A. Wilson, the retiring president, and Laurens Enos, former president.

Richard Kennerdell, chairman of the contest committee, told of the work accomplished by this important body and how motor competition had been kept on a high plane. George C. Diehl, chairman of the good roads committee, presented a brief report on the work of the committee.

Members of the American Automobile Association at the annual banquet

New Mechanical Principle in Dorr Miller Differential

Device Performs Functions Without Gears

THE mechanical principle governing the construction of the Dorr Miller differential manufactured by the Miller Transmission Co., of Chicago, is not only new in motor car construction but brings about the alternate rotation of two shafts in parallel without the aid of gears, in a way never before used. The makers claim for it a positive pull at all times without the aid of gears or ratchets, a perfect differentiation while the power retains the average speed of the two wheels, elimination of skidding danger, no spinning of wheels, increased power and minimum wear.

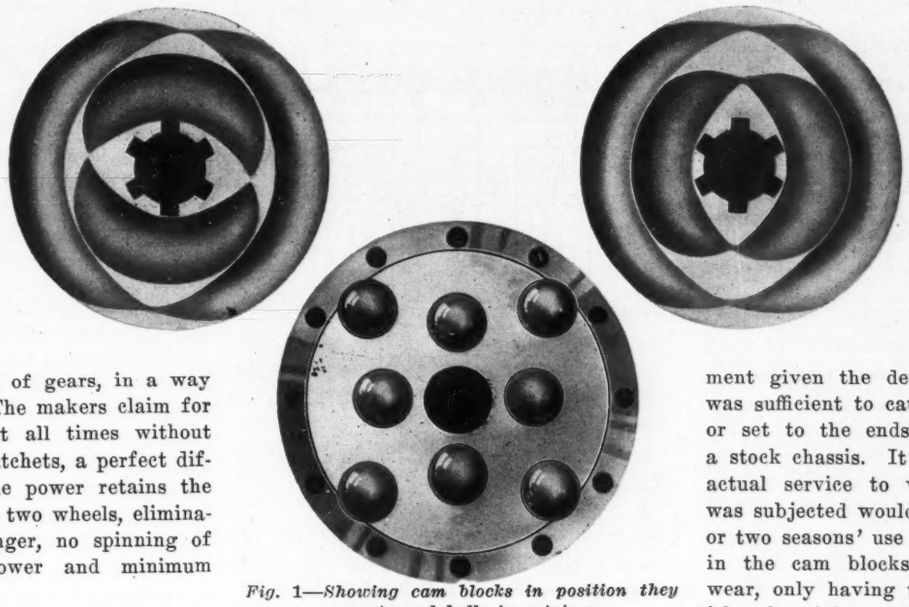


Fig. 1—Showing cam blocks in position they operate and balls in retainer

The device consists of two circular cam blocks of chrome-silico-manganese steel, a ball retainer or central drive plate of chrome-nickel steel, eight one-inch steel balls, and two cast-iron friction or collar-bearing plates, assembled in a steel casing of two pieces held together by twelve $\frac{5}{16}$-inch bolts. The cam grooves, in which the balls run, are so curved as to always provide ample room for each of the eight balls for all angular positions of the cam blocks. When the differential is assembled the cam blocks are face to face with the ball retainer and center driving plate between. A collar bearing plate is at the back of each.

The grooves in the cam blocks are cut on two radii and the inner two grooves of one block face the opposite two of the other. The grooves in each cam block are cut deep enough to take care of the radius of the ball and the small amount of clearance needed. When the whole is assembled to an axle, each of the two drive shafts is connected to its corresponding cam block.

Fig. 2—This illustrates the differential completely assembled

Application of power to the ring-gear creates a wedging action of the balls against the cams which action produces pressure against the cam blocks which is transmitted to the collar-bearing plates. The resulting friction causes the parts to lock. The collar-bearing plates, of cast iron, work against the steel surfaces of the cam blocks, making a very efficient friction bearing.

How It Works

In straight driving there is a constant distribution of torque to both rear wheels. The angle of the cams is about equal to the angle of the worm gear. When unequal torques are applied to each brake wheel, that is the action created when the car turns a curve, assume that one of the cam blocks moves very slightly while the other remains stationary. It is then evident that, if the balls be forced to turn by the movement of the first block they are going to enter the curve of one block while they are leaving the curve of the other, allowing one block to slip past the other, thus causing differentiation.

It is claimed that the action is such that a great portion of the torque is thrown to the side which is moving at the slowest rate, or in other words, to the inner wheel in turning. This quality of the device is said to minimize skidding, as it locates the driving effect at a point to prevent skidding, tending to throw the car in the opposite direction from the one in which it is being steered so that it cannot assist in rotating the motor car. This same quality is also supposed to prevent the spinning of one wheel having less traction as compared with the other wheel.

In order to differentiate in turning a corner under heavy load, the tractive force will be limited to the adhesion of one wheel plus a small fraction of the adhesion of other wheel on the road.

Exhaustive tests of the Dorr Miller differential were made by the department of mechanical engineering of Purdue University. The treatment given the device during the tests was sufficient to cause a permanent twist or set to the ends of a drive shaft in a stock chassis. It is estimated that the actual service to which the differential was subjected would be equivalent to one or two seasons' use in a car. The grooves in the cam blocks showed no signs of wear, only having taken on a slight polish; the eight steel balls showed a very small amount of wear.

The results of the test, according to the university report, demonstrate that the device will differentiate perfectly, will permit an equal distribution of power and torque to both rear wheels, will permit of a greater torque being transmitted to one wheel than the other, the amount depending on the character of the rubbing surfaces and the speed, perfect lubrication and ample strength.

BLUE LAW CAUSING BOTHER AGAIN

Springfield, Mass., May 20—As a result of the legislature failing to pass the law to allow the sale of gasoline, tires, etc., on Sunday, the police here have notified the garage men that they must obey the law. The trouble originated at this city when one of the garagemen was summoned into court and convicted. The case was placed on file on an agreement to abstain from future violations and then the bill was put in the legislature. It went through the lower house and was killed in the senate.

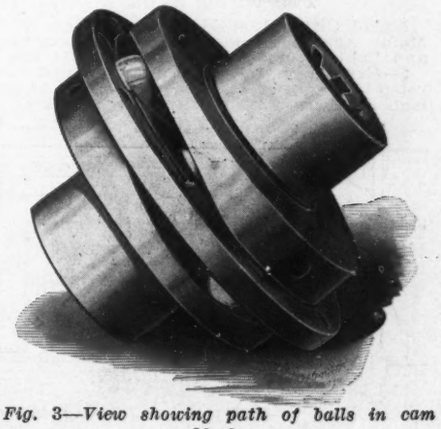


Fig. 3—View showing path of balls in cam blocks

The Readers' Clearing House

FIRING ORDER FIGURED FROM CAMS

Method of Timing Magneto from Valve Action Explained

BELOIT, Wis.—Editor Motor Age—I have been studying valve timing of engines and desire more information on the matter. In the February 10 issue of Motor Age there was published the N. A. C. C. horsepower formula. Does this formula apply to a T-head motor, and if not, what is the formula for the horsepower of a T-head, L-head, or valve-in-the-head motor?

2—Does one have to take the valves into consideration, that is, the bore and the lift of the valve, also the diameter of the valve?

3—How can one tell the firing order of an engine by looking at the cams or camshaft, when it is out of the engine. I can get the firing order all right by the closing of the exhaust valves or intakes, but I mean the time point of telling when the cam is out of the engine?

4—Where should the piston be in the cylinder at the time the breaker should break in the magneto? I think about 1/16 to 3/8 down on the power stroke of the engine at retard. Am I correct in this?

5—Advise the correct method of setting or putting on a magneto, also as regards the brakes in order to get the best results when valves and other conditions are all right.—J. Smith.

1—The N. A. C. C. horsepower formula applies to all four-cycle gasoline motor car engines regardless of type.

2—No.

3—First locate the intake cams of each cylinder on the camshaft. Set the cam of number one cylinder up. Then rotate the cam in the direction it rotates in the motor. The next intake cam to come up designates the second cylinder to fire, the next the third, etc. This, of course, applies to a single camshaft motor. With a double camshaft the same conclusion can be reached by figuring from the intake camshaft.

4—This varies with different makes of motors. You would be safe in trying the adjustment you suggest, however, of course providing that the spark is set at full retard.

5—It is common practice to set the breaker-box so that when number one cylinder passes the point of dead center, that is at the top of the piston stroke, the points for number one cylinder will break, this with the spark lever at full retard.

Two Wiring Systems

Malad City, Ida.—Editor Motor Age—Will Motor Age kindly give drawing of starting and lighting system used on the 1914 Reo?

2—Explain in full why a motor will develop more power at sea level than at 12,000 feet. Is there some way to overcome this?

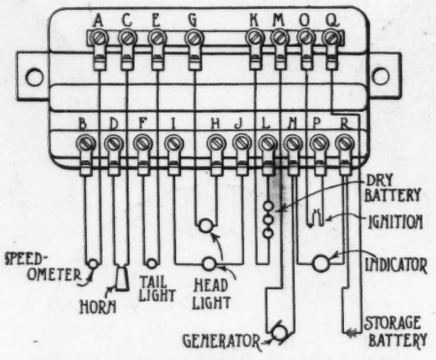


Fig. 1—1915 Studebaker switch wiring

3—Give drawing of the electric system used on 1915 Studebaker four. Show wires through switch.—C. W. Lundy.

1—This is given in Fig. 2.

2—The reasons for the falling off of power at high altitudes are fully explained on page 30 of the April 6, 1916, issue of Motor Age.

3—Such a wiring diagram of the 1915 Studebaker is shown in Fig. 1.

CHEMISTRY OF GAS EXPLOSION

Formula of Action in Engine Cylinder When Fuel Is Ignited

Wauwatosa, Wis.—Editor Motor Age—What is the formula for the chemical action taking place in the explosion of the gas mixture in a gasoline engine?

2—Where can literature be obtained on the new aluminum alloys used in pistons?

3—What are the elements used in the aluminum alloy, Lynite?

4—In the new racing motors in which four cylinders feature, with four valves to the cylinder, do the valves of the same kind, for example, the pairs of exhaust or the pairs of intake valves, open at the same time in each cylinder, so as to accommodate more gas, or do they alternate? If they alternate, is there double the number, or four explosions to one turn-over of the crankshaft instead of two?

5—Can five-cylinder motors be four-cycle?

6—Will there be any new Fiat or Peugeot racing cars entered into American contests this year?—Frederic Doerfler.

1—Gasoline is composed largely of hexane, which contains 6 molecules of carbon, namely, $n = 6$ combined with 2×6 plus $2 = 14$ molecules of hydrogen $= C_6H_{14}$. The term combustion may be defined as the union of a substance with oxygen. Both hydrogen and carbon, when raised to the required temperature, in the presence of air unite very readily with the oxygen in the air, the hydrogen forming water and the carbon, carbon-dioxide, CO_2, when the proper quantity of air is present, or carbon monoxide, CO, when there is insufficient air for complete combustion. These reactions may be expressed as follows, if we assume gasoline to be composed entirely of hexane:

$$2C_6H_{14} + 19O_2 + 71.3N_2 = 12CO_2 + 14H_2O + 71.3N_2$$

This equalization shows perfect combustion in which all the carbon is oxidized to CO_2 and all the hydrogen has formed water.

The following equation presupposes an insufficient amount of air and its consequent imperfect combustion:

$$2C_6H_{14} + 17.5O_2 + 65.8N_2 = 9CO_2 + 3CO + 14H_2O + 65.8N_2$$

Here the oxidation of the carbon has been incomplete, resulting in the formation of both CO_2 and CO.

2 and 3—The properties are a secret but the elements are aluminum, magnesium and possibly small amounts of copper silicon and iron. Write to the manufacturers of these alloys as announced in the advertising columns of Motor Age.

4—Both intakes in any one cylinder operate simultaneously and both exhaust valves operate together.

5—Yes.

6—Probably not.

BUICK KNOCK IS CAUSED BY GAS

Reader Suggests Reason for Inquirer's Trouble—Coupling Engines

Webster, S. D.—Editor Motor Age—In the April 13 issue of Motor Age, Readers' Clearing House department, A. V. Kanble, Clovis, N. M., stated his Buick D 45 had developed a knock. I believe this knock is an exhaust knock from cylinder No. 3. I have had one of these running in a dark room with the exhaust manifold removed, and this knock could be distinctly heard when the flame came through the valve cage, and not at the time spark occurs. The knock is a peculiar one and usually is heard when idling and stops when the first plug is shorted.

1—Would it be possible to build a V-type, four cylinder motor by coupling up two twin-cylinder, air cooled engines, such as the De-Luxe cyclecar motor. These motors are very powerful. I desire to build such an engine for a light car to use in ½ mile races. I realize the firing order would not be even but, then, it is not even in a twin-cylinder motor.

2—Would not the absence of dead centers neutralize to some extent the difference in degrees between explosions? If this would not be possible, kindly give reasons.—Thomas H. Lilley.

1—Such an arrangement would be a possibility, but its success is questionable. If you have in mind, as we believe you do, coupling together the two engines entire with a universal or ham coupling between the crankcases, the question of equal ignition advance and throttle opening would be a big factor. We conceive the possibility of spark and throttle adjustments being such that one motor would become a load on the other, decreasing rather than increasing the power. Furthermore, the strain on the coupling, due to the irregu-

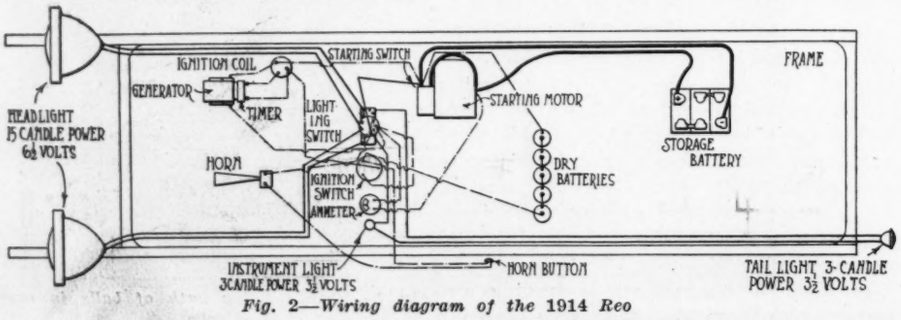


Fig. 2—Wiring diagram of the 1914 Reo

larity of power impulses, would be severe. It is possible that you could have a crankshaft built up to take care of the four cylinders, the two motors firing oppositely; but, then, again, would arise the question of timing whether you would use the two magnetos or have a special one constructed to take care of the combination.

2—Probably. However, we offer the difficulties described above in taking care of the strain of one motor practically pulling against another.

WANTS TO BUILD FREAK SPEEDER

Coupling Two Ford Motors End to End Presents Problems

Lakota, N. D.—Editor Motor Age—I am building a car of my own design and desire the following information in regard to eight-cylinder motors. Would it be possible to make two model T Ford motors perform properly if the crankshafts were coupled together?

2—Would the crankshaft be liable to whip at high speeds?

3—Would it be better to equip the motor with aluminum pistons?

4—Why is a V-type motor better than one that would have the cylinders strung out in one straight line?

5—Are there any motors built with the cylinders in a straight line?

6—What size carbureter would be best for this eight-cylinder motor? Would 1-inch be too small?

7—Will a carbureter that will work on a four-cylinder motor work on a six-cylinder or eight-cylinder with the same bore and stroke?

8—What power would an eight-cylinder motor of this type develop? Would it develop more than a V-type motor with the same bore and stroke?

9—Would this motor run at a higher rate of speed than the common four-cylinder Ford motor?—B. Keitzman.

1—It would be possible, but with what amount of success we are not in a position to tell. We have record of such a construction which proved fairly successful, but have no data regarding the methods of carburetion and ignition.

2—If both motors were properly supported and connected with a flexible coupling there should be no such trouble.

3—Aluminum-alloy pistons would lighten the reciprocating parts with a resultant addition in power and speed.

4—It saves space and eliminates the possibility of weave, which would possibly occur in a motor of great overall length. Vibration is also reduced.

5—Nothing to our knowledge, with more than six cylinders.

6—If you were to attempt to feed eight cylinders in a motor of such a design from one carbureter you would have trouble carrying the gas to the far cylinders. Better to use two carbureters such as used on multiple-cylinder marine motors.

7—No. Submit your motor specifications to a carbureter manufacturer for his advice.

8—This could only be determined by horsepower tests from the motor itself. It would not develop more than a V-type motor.

9—Not appreciably when running idle. Under load, yes.

Commutator Spring Stretched

Windsor, Wis.—Editor Motor Age—I have experienced the same trouble as Gene Carter, of Rector, Ark., as per his letter on page 35, March 23 issue of Motor Age. The trouble I have always found to be caused by the spring in the commutator being stretched till it will allow the roller to drop down and not make contact with the segment which is on the top of the commutator. If this is his trouble it can be overcome by cutting a few rounds of the spring off and therefore increasing the tension. I have found more trouble from this than any other one thing on a Ford.—R. V. Savage.

Inquiries Received and Communications Answered

J. Smith.....Beloit, Wis.
C. W. Londy.....Malda City, Ida.
Frederic Doerfler....Wauwatosa, Wis.
Thomas H. Lilly.....Webster, S. D.
B. Kietzman.....Lakota, N. D.
R. W. Savage.....Windsor, Wis.
Lee Rogers.....Greene, Ia.
Karl L. Keck.....Stockport, Ia.
William P. Costello.....Peoria, Ill.
Theo. Helbing.....Gridley, Ill.
L. C. W. Schnider.Narrowsburg, N. Y.
C. H. Wagner.....Anita, Ia.
E. A. Levene.....Central City, Neb.
E. I. Johnson.....Spring Grove, Minn.
George Kebel.....Spokane, Wash.
E. Nordhoff.....Seattle, Wash.

No communications not signed by the inquirer's full name and address will be answered in this department.

WHY NOT THREE-CYLINDER MOTORS?

Cannot Balance Four-cycle Engines of Such a Type With Any Success

Greene, Ia.—Editor Motor Age—Why do they not build an engine with three, five or any odd number of cylinders, and if practical, how would cost of running be compared?—Lee Rogers.

Simplicity and balance are the chief reasons for the universal use of four-cycle engines having a number of cylinders equaling a multiple of two. In the four-cycle engine there are four events that have to be completed for every power impulse per cylinder given to the crankshaft: that is, the piston has to move downward twice and upward twice to complete the cycle. Therefor, the crankshaft revolves twice to receive one impulse from a given cylinder. With four cylinders there is a power impulse every half-revolution, or two per revolution; with a six there are three impulses per revolution; with an eight, four. If the motor were a three-cylinder there would be one and one-half impulses per revolution of the crankshaft.

With such irregularity between the power impulses and motor revolutions it is impossible to obtain a correct balance. Of course, in the case of two-cycle motors where there is a power impulse from each cylinder to each crankshaft revolution, the difficulty above mentioned is not a factor. The fuel consumption per cylinder in a motor with an odd number of cylinders would not be appreciably different than in a motor with an even number of cylinders.

The Thomas at one time was built with three cylinders, but was considered badly out of balance. When cylinders, instead of crankshaft, rotate, an odd number of cylinders is permissible, as in the Gnome aviation motor with its seven and fourteen cylinders and the old Adams-Farwell with five.

IS POWER GREATER ON REVERSE?

Pulling Ability of Engine Depends on Gear Reduction to Wheels

Stockport, Ia.—Editor Motor Age—Does an overhead valve motor give more power than a side valve, and if any, how much?

2—Which would have the most power, a six with small cylinder bore or a four with large cylinder bore?

3—Which will afford the most mileage for the cost, a 32 by 3½ tire or a 33 by 4 tire?

4—How many cylinders does the average manufacturer use in their racing cars and which has won the most races.

5—Does a motor car have any more power in first speed than it has in reverse, or which way will it pull the best and state why it will.

6—Is the Marvel carbureter considered a good one?—Karl L. Keck.

1—Opinions vary.

2—A four with enough larger bore than a six will naturally develop more power. It is entirely a matter of motor size.

3—Used on cars of the same weight, the larger tire will give greater mileage per initial cost under ideal conditions; that is, if wear alone is considered and the element of disastrous cuts or punctures is eliminated.

4—Four-cylinder motors in racing cars have prevailed since the inception of the sport. Also fours have won the most races.

5—It has no more power in any gear than in any other, but will pull greater loads in low gears than in high because it is moving the load more slowly. Power

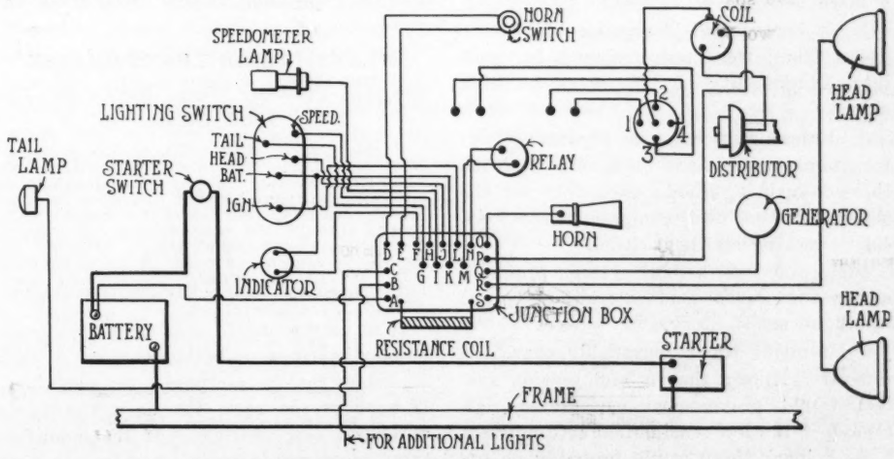


Fig. 3—Wiring diagram of the **1916** *Studebaker four*

is load times speed times a constant. So with a motor of a given power a greater load can be pulled if the load is moved slowly while the engine is running at its best speed. As the reverse usually is lower than first, greater loads usually can be pulled.

6—Yes.

INSTALLATION OF REAR GAS TANK

Might Increase Power by Reducing Length of Manifold

Peoria, Ill.—Editor Motor Age—On a five-passenger car designed to carry the gasoline tank under the front seat, would there be any advantage in hanging the tank in the rear with some form of pressure or vaccum feed. Please give advantages and disadvantages of both systems.—Wm. P. Costello.

The only advantage obtainable by changing to either system would be to allow the use of a shorter manifold, thus increasing the vaporizing efficiency of the carbureting system and to eliminate the trouble of starving the carbureter when climbing an exceptionally steep grade. Also there is the factor of ease in filling the gasoline tank and freedom from the annoyance of gasoline being splashed over onto the upholstery or on the floor of the driver's compartment. Pressure and vacuum systems are equally efficient if properly installed. The pressure system, however, has the disadvantage of being susceptible to leakage of air pressure unless the piping and connections are very solidly installed to insure against loosening from constant vibration.

Would Interchange Manifolds

Seattle, Wash.—Editor Motor Age—Will a Pierce-Arrow 36 or 28 intake manifold fit on a 1913 six-cylinder Stutz?

2—What year Pierce intake manifold would work the best?

3—My 1913 Stutz is equipped with a Splitdorf low-tension magneto, dual type. As the car has to be cranked on the battery with the same timing as when on the magneto I cannot give the magneto all the advance I would like to. What change would Motor Age suggest?

4—What type of high-tension Bosch magneto is recommended?

5—Would starting be easy, cranking by hand with a magneto of this type?

6—Would there be any noticeable increase in power in changing from a low-tension magneto to a high-tension Bosch?

7—Would a two-point magneto give a noticeable increase in power? How would easy starting be accomplished?—Ed Nordhoff.

1—Probably not. If it did, it would be a mere accident.

2—It is doubtful if any would be suitable. They were not designed for such interchangeability as you seem to think exists.

3—Unless you have a separate timer for the battery and magneto circuits, there is nothing to do except to set the timer for the best compromise between easy cranking and best speed.

4—If you used a dual system, probably either the Bosch Du6 or the ZR6 type would be satisfactory.

5—It ought to be reasonably easy.

6—It is likely that a high-tension system would prove most satisfactory, although if the low-tension magneto delivers a good spark there would probably be little difference in the power with either equipment.

7—Due to the fact that two sparks would be delivered simultaneously to different parts of the charge, the rapidity of combustion would be increased a little by the two-park arrangement, but there would not be any great difference in the power. For the same reason, the starting might be improved by having two sparks, but this is also a question that experience would have to answer.

WHEEL AND ENGINE SPEEDS

TIRE SIZE	WHEEL R.P.M.	ENGINE REVOLUTIONS PER MILE — 3 to 1	3½ to 1	4 to 1	4½ to 1	5 to 1	5½ to 1
30	672.2	1916.6	2242.7	2688.8	3024.9	3361.0	3787.1
32	631.7	1895.1	2210.9	2526.8	2842.6	3158.5	3474.3
33	611.1	1833.3	2138.8	2444.4	2749.9	3055.5	3361.0
34	593.2	1779.6	2075.2	2372.8	2669.4	2966.0	3262.6
35	576.2	1728.6	2016.7	2304.8	2592.9	2881.0	3169.1
36	560.2	1680.6	1960.7	2240.8	2528.9	2801.0	3081.1
40	504.2	1512.6	1764.6	2016.8	2268.8	2520.0	2772.0

WHY NOT MORE KEROSENE

Lack of Popularity and Thorough Experimentation Prime Reasons

Central City, Nebr.—Editor Motor Age—Why did the Henderson kerosene burning car have such a short life and limited amount of popularity? Was it not a success? It must have at least been partially successful if the car could be driven across the continent.

2—What are the principles of the carbureter on the Henderson that it can burn oil better than the ordinary carbureter?

What is the result of oil burning on the motor? Does it leave a greater deposit of carbon than gasoline?—E. A. Levene.

1—Possibly, although the car operated satisfactorily, the public was not willing to accept the innovation. It is often a matter of what the public will buy, not what the car will do.

2—Intense heat on the carbureter standpipe brought about by jacketing it with exhaust tubing.

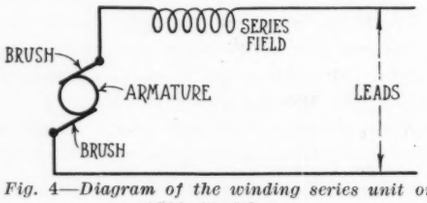


Fig. 4—Diagram of the winding series unit on 1916 Studebaker

3—Numerous tests have brought varying results. The consensus of opinion is that at high speed kerosene deposits less carbon than gasoline; at low speed about the same.

TRANSMISSION LEAKS GREASE

Bearings Probably Worn—Should Not Use Hard Grease

Spring Grove, Minn.—Editor Motor Age—I have a 1912 Buick 29 which leaks grease into the transmission case. This leakage is through the front bearing and goes into the clutch housing, and looks to me as if it leaked through the rear bearing. The Buick company recommended steam cylinder oil, or 600 W and not grease. I have tried all kinds of oils and greases but they all work out. How can this leakage be remedied?—Eldred I. Johnson.

It is very probable that either the front or rear bearings, or both, are worn to such an extent that grease passes through them. If such is the case, the only remedy is to install new bearings. If the manufacturer recommends steam cylinder oil, that is the kind you should use. Hard greases may ruin the gears, as the gears will often cut a path in the grease and run dry until sufficient heat is created to soften the grease so that it will flow into the gears.

MOTOR REVOLUTIONS VS. SPEED

Formula Showing R.P.M. from Miles Per Hour Tire Size and Gear Ratio

Spokane, Wash.—Editor Motor Age—In the May 20, 1915 issue of Motor Age was published a chart for finding the r.p.m. of motors, when the gear ratio, car speed and tire size were known. I should like very much to have a formula for finding this if Motor Age can furnish it.—George Kebel.

To compute the r.p.m. of a motor with gear ratio, miles per hour and tire size known it is first necessary to compute the wheel revolutions per mile which can be gained by dividing the feet or inches in a mile by the feet or inches in the tire circumference. The quotient multiplied by the miles per hour will give the wheel revolutions per hour and, of course, it is necessary only to multiply this total by the gear ratio and reduce from hours to minutes to give the motor speed. Following is the formula:

$$\frac{63360 \times \text{m.p.h.} \times \text{gear ratio}}{\text{tire dia.} \times 3.1416 \times 60} = \text{r.p.m.}$$

Series, Motors and Generators

Gridley, Ill.—Editor Motor Age—Kindly furnish a diagram for wiring the Studebaker 1916 model.

2—Please explain the difference in winding of a series wound motor and a series wound generator. Kindly furnish diagram of same. —Theo. Helbling.

1—Wiring diagram of the 1916 Studebaker cars is shown in Fig. 3.

2—There is no difference in the windings. In other words, the motor will operate as a generator, and the generator as a motor, if the conditions are reversed. Diagram of the winding is shown in Fig. 4.

Size of Brake Lining

Narrowsburg, N. Y.—Editor Motor Age—Your article on brake adjustment was very complete, but not fully so to meet my needs. I had my brakes relined late last autumn and one of them I can not get adjusted properly. It seems that the lining keeps the band from springing uniformly from the drum. Is it possible to have the lining do this?—L. C. W. Schneider.

If the lining is too thick or too thin we could conceive such a trouble. The makers of your car would, undoubtedly, give you specifications for the correct size of lining to use.

Wheel and Engine Speeds

Anita, Ia.—Editor Motor Age—Please publish a table giving the number of revolutions a tire makes in going a mile, sizes 30 inches to 40 inches, on direct drive, or publish a chart giving the number of revolutions an engine makes to the mile at any gear ratio from 3 to 5½ times turning to drive wheels, using any size tire from 30 inches to 40 inches on direct drive.—C. H. Wagner.

This is shown in the table at the top of this page.

The Motor Car Repair Shop

Carbureter Troubles and Their Remedy

Giving the Fundamental Principles for Making Your Own Adjustments

WHEN once properly adjusted and left alone carbureters seldom, if ever, give any trouble in the average car; but in new cars or cars that have seen considerable service carbureter trouble eventually will show up in one form or another and quite often some other part of the engine is blamed for the difficulty. The following short article will describe the carbureter troubles most common among average motors, giving the symptoms of trouble as shown by the action of the engine and the location and remedy.

Overrich Mixture

This is without doubt the most common of all carbureter troubles and the hardest to locate by the average motorist. If the mixture of gasoline and air in the carbureter is very rich, that is, more gasoline than air, black smoke will appear in the exhaust pipe, also the action of the engine will be sluggish; if the mixture is too rich, but not rich enough to produce smoke, it will produce a pungent, acid odor in the exhaust, and will probably cause overheating of the engine, unnecessary sooting of the plugs, accumulation of carbon in the motor, and unnecessary consumption of gasoline, with diminished power.

The causes of an overrich mixture are many and varied. It may be due to poor adjustment of the needle valve, that is, too much gasoline or not enough air, leaky float, leaky float valve, float too high on its stem or too heavy, spray nozzle loosened or unscrewed by engine vibration, and an obstructed air-intake pipe, mud possibly having splashed into it.

If the trouble is simply a poor adjustment of the carbureter try gradually shutting off the needle valve or giving the carbureter a little more air. If the trouble is with the float be careful about tampering with it as the delicate parts of the float valve are easily broken; better let a mechanic fix it.

Among the symptoms of trouble produced by a weak mixture are insufficient development of power, although the engine explosions may be regular, and probably the engine will occasionally, depending according to how weak the mixture is; also, the engine sometimes will miss every other explosion, and there will be great difficulty in starting the engine.

Simply turn the carbureter needle valve a little so as to let in a little more gasoline and possibly cut down the air supply a little. Note the action of the engine when making an adjustment and be careful not to over-do it and get too rich a mixture. It is not always easy to distinguish between lack of power due to an overrich mixture and that due to a weak mixture.

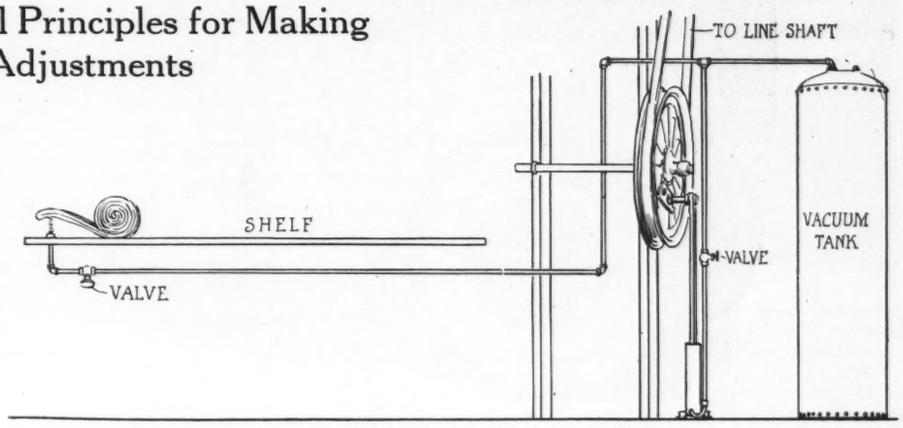


Fig. 1—Reader's device for deflating inner tubes

However, it is well to remember that the tendency of the former is to produce black smoke and explosions in the muffler, while that of the latter is to preignite and cause back-firing into the carbureter, as well as miss-firing.

Another cause of a weak mixture, which is not easy to locate, is a leak in an inlet pipe which allows air to be drawn into the mixture. If the leak is in a branch that leads to one cylinder only, that cylinder will receive a weak mixture. If the air leak is large, the dilution of the mixture for the one cylinder will be sufficient to cause misfiring and possibly back-firing into the carbureter, even though the latter is properly adjusted for the remaining cylinders.

One way of discovering a large leak in an inlet pipe is by holding the hand around the pipe where a leak is suspected and the current of ingoing air will be felt.

If the leak is small a liberal supply of cylinder oil placed around the joint generally will indicate the leak, because the oil will be drawn into the pipe. The remedy for a leak in an inlet pipe is to repack or otherwise refit the leaky joint. Small holes in the pipe may be repaired temporarily with several turns of tire tape tightly wrapped around the pipe.

Flooding of the carbureter, that is, the gasoline overflowing out of the bowl, may be caused by dirt on the float valve. Flooding is highly dangerous on account of the liability of the gasoline catching fire.

If dirt is in the spray nozzle, it will produce a weak mixture; if dirt has been splashed into the air intake, it will produce a rich mixture, especially at high speeds. The remedies for trouble caused by dirt in the carbureter are obvious.

Dirt in Gasoline Pipe

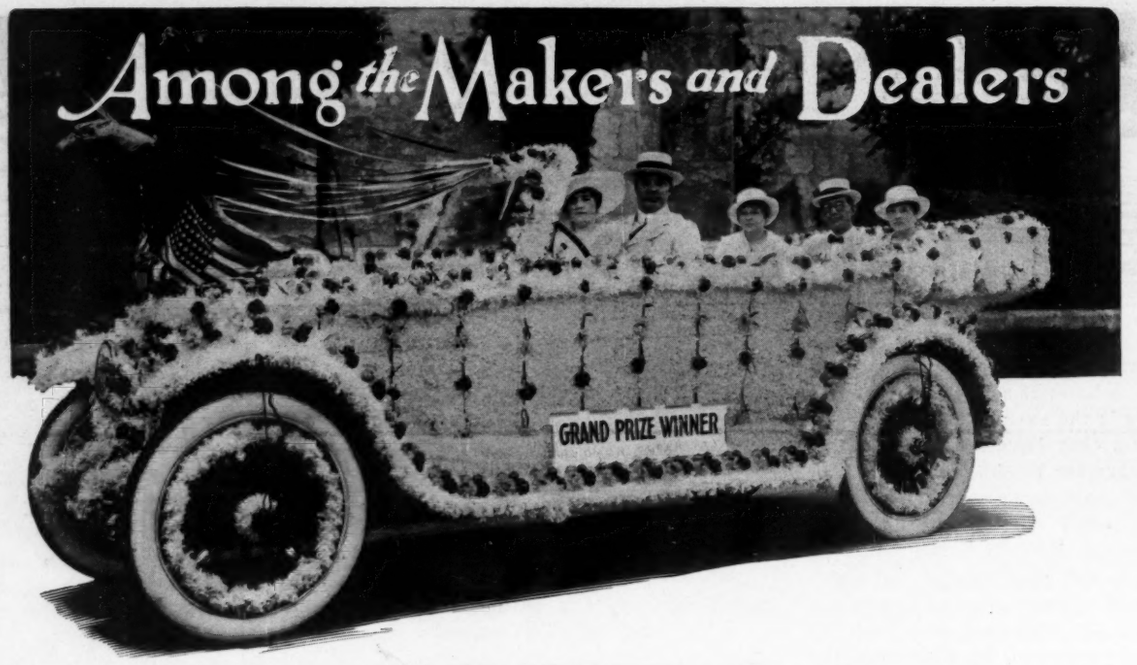
The symptom of a gasoline pipe becoming obstructed is a sudden or gradual weakening of the mixture, which may eventually cause the engine to stop. If the engine will start promptly after standing a few minutes, run well for a time, and then stop again, it is almost always due to an obstruction to the flow of gasoline, either in the feed pipe or in the carbureter passages.

The best way to clear out the feed pipe is by blowing through it with the tire pump after having disconnected the pipe from the carbureter. If there is a strainer between the tank and the carbureter, the strainer may have become clogged and should be removed and cleaned. To test a gasoline feed pipe, close the cock at the tank, disconnect the pipe from the carbureter, and open the cock again; if a full flow of gasoline comes from the end of the pipe, it is clear.

With a leaky float valve, the carbureter drips gasoline, due to flooding. The leakage is not stopped by a priming that would remove a small particle of dirt on the float valve seat or in the spray nozzle. The trouble may be remedied by grinding the valve to its seat. Be careful not to overgrind it so as to destroy the fine point or shorten the length of the valve to any great extent or it will not seat properly.

This is a difficult trouble to locate as its symptom is simply flooding of the carbureter, which may be caused by many things. Metallic floats often spring a leak and the hole may be soldered up or a new float secured; the latter method is much preferred as gasoline will leak even through a porous place in the metal.

Among the Makers and Dealers



Hudson Super-Six which won the grand prize in a recent pa rade at San Antonio, Tex.

MICHIGAN Stamping Co. Will Build—The Michigan Stamping Co. will erect a one-story building, 600x347 ft., on Mack avenue, Detroit, Mich., near the Lozier plant.

Earl Welborn, Manager of Isko, Inc.—Earl Welborn, Detroit, Mich., former assistant of Henry B. Joy, president of the Packard Motor Car Co., has resigned to become general manager of Isko, Inc., a new corporation which has taken over the old plant of the Grabowsky Power Wagon Co.

Opper Goodrich Branch Manager—Paul T. Opper, who has been connected with the Detroit branch of the B. F. Goodrich Rubber Co. for a number of years as assistant manager, has been promoted to the position of branch manager to succeed H. J. Morehead, resigned.

Tire Machinery Held Up—Although contracts for the complete equipment of the new plant of the Gillette Safety Tire Co., Eau Claire, Wis., were placed months ago, and the big factory is now well under way, the makers of the machinery are reporting difficulty in getting raw material and intimate that there may be delay in making deliveries as specified. The experience is common among machinery users in Wisconsin, who are experiencing great difficulty in meeting their requirements and have consequently held up extensions to their plants.

Elgin Moves Its Headquarters—On May 15 the Elgin Motor Car Corp. moved its general offices, display, sales and service station to the new Elgin building, 2427 South Michigan avenue, Chicago.

Rock Falls Mfg. Co. Adds to Its Line—A correspondent for Motor Age through error wrote the name of the Rock Falls Mfg. Co., Sterling, Ill., as the Rock Falls Casket Co., in a news item which appeared in the issue of April 27, stating that the company had begun the manufacture of motor hearse bodies. The Rock Falls Mfg. Co. is one of the oldest hearse builders in the country, being founded in 1877. It has handled caskets and undertakers' supplies until 4 years ago, when the firm went into the vehicle business and discontinued the manufacture of caskets. The company is about to convert a part of its plant into a motor car body factory and will make special bodies, both pleasure car and limousine, custom built, and a full line of sport cars.

Association Employs Credit Experts—G. F. McGann, who for 14 years has been a student of ratings and who is familiar with the motor car trade, and S. J. Berry, have been employed by the Washington Motor Trades Association of Seattle, Wash., to promote a state-wide campaign to bring the motor car dealers, garage and accessory houses in touch with each other with a view of preventing losses by improper credits and promoting business by extending time?

Heartz Resigns Hupp Position—Following the resignation of Roy D. Heartz as promotion manager of the Hupp Motor Car Co., to become assistant sales manager of the Premier Motor Car Corp., Indianapolis, Ind., James G. Roe, who has been doing special work in the sales department under Mr. Heartz, at Detroit, Mich., has taken charge of the promotion work and Arthur E. Dixon of the service department has taken Mr. Roe's position in the sales department.

Packard Gets New Property—The Packard Motor Car Co., Detroit, Mich., has acquired the plant formerly occupied by the Krit Motor Car Co., which adjoins the Packard property on East Grand boulevard. This plant has been vacant since the Krit concern failed some time ago, and the ground has a frontage of 300 feet with a depth of 600 feet. The factory buildings are three-and two-story structures of brick. Packard has made no decision as to what it will do with the property, but will probably use it for future expansion.

Now Called Zapon Leather Cloth Co.—The Boston Artificial Leather Co., New York, has changed its name to the Zapon Leather Cloth Co. This concern has been in the leather cloth business for more than 25 years. The original Boston Artificial Leather Co. was located in Boston, Mass. The main offices were removed to this city in 1899. The original plant in Massachusetts was later removed to Milburn, N. J., and in 1904 to Stamford, Conn., where it is today. This plant has just been rebuilt and the size trebled. The company does a large business with the motor car manufacturers in heavy seating material. No light weight goods are

TOURING CAR WITH ORCO TUBE—George A. Newton, Wooster, O., took a 35 by 5 Orco tube out of stock, and, with it, towed an Oldsmobile six, loaded with six people, for seven blocks up the main street of Wooster, at a 22 per cent grade. Upon reaching a level street, they loaded twelve college students into the Oldsmobile and towed them for ten blocks around the town. Up the hill, the weight of car and six passengers was approximately 4,300 pounds, and on the level street the weight was over 5,700 pounds. After the demonstration the tube was found to be as good as ever.

PARADE BEHIND MEX COLONEL'S CAR—Despite alarmist reports current in the north, the best of feeling prevails between the twin cities of Juarez, Mex., and El Paso, Tex. When Col. Arturo J. Fajardo, Twentieth-eighth regiment, brigada Gavira, wanted a touring car, he went over to El Paso. Ad Buquor, the Maxwell salesman, drove it over to Juarez for the army man and when the car reached the international bridge, the salesman threw half a dozen mental fits, for Fajardo's regiment, with fife and drum corps, was lined up just over the boundary. Buquor remembered that he had been paid for the car in El Paso, so ceased to worry. The regiment marched in line behind the car.

made. The use of the word Zapon brings the Celluloid Zapon Co. and that company closer than ever before, these two having for more than a generation been affiliated.

A. B. Pfau Handles Pfau Advertising—A. B. Pfau has been appointed advertising manager of the motor car specialty department of the Pfau Mfg. Co., Cincinnati, O.

S. F. Dupree, Jr., Resigns Former Post—S. F. Dupree, Jr., who until recently was in charge of the Ford department of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., has severed his connection with that company and is now vice president in charge of the sales and advertising of the Caskey-Dupree Mfg. Co., Marietta, O.

Percy Owens Makes Offer to Students—The president of the University of Michigan has received a letter written by Percy Owen, president and general manager of the Liberty Motor Car Co., in which the Liberty company offers to start a movement whereby it will assume the payment of all expenses incurred in giving a military training to suitable college students, at the military training camp at Plattsburg, N. Y. This offer includes transportation expenses to Plattsburg and return and all expenses which will be contracted at the training camp by the men who may be selected.

Racine Rubber Employes Strike—The Racine Rubber Co., Racine, Wis., has been experiencing slight labor troubles since May 9 because of a walkout by seventy-five workmen as a demonstration against the action of the company in re-engaging a foreman of their own nationality when it became known that he had sold positions to his countrymen and had exacted approximately $500 out of the deals. The strikers sent a communication to the company that they would never go back to work if the foreman is re-employed.

New Era to Add—E. F. Alvin, Joliet, Ill., president of the New Era Engineering Co., manufacturing the New Era car, has about closed a deal for the purchase of a factory site north of Joliet on the line of the Elgin, Joliet & Eastern railroad. The company will at once commence the erection of an initial unit which will give a capacity of twenty-five to fifty cars per day and furnish employment to 400 men. At present the company occupies a two-story building in Joliet, but the capacity is far too small and the company feels the need of a plant located upon the line of a railway. The capital stock has been increased to $200,000.

Chief Engineer of Denby Resigns—L. C. Freeman, one of the incorporators and chief engineer of the Denby Motor Truck Co., Detroit, Mich., has resigned his position, but will still retain his interest in the company.

Teach Cadillac Owners—To give motor car owners in general, and owners of Cadillac eights in particular, a better understanding of their cars, the Jonas Automobile Co., Milwaukee, Wis., conducted a series of lectures recently by E. Phil Merrill, on the topic, "Know Your Car Better." For demonstration purposes, a cut-out Cadillac eight chassis was used, it being a duplicate of the one shown at the world's fair in San Francisco. Large crowds attended each of the lectures and the Jonas company expresses itself as being satisfied that it is well repaid for the effort.

Recent Incorporations

Akron, O.—Oak Rubber Co.; capital stock, $5,000; incorporators, J. C. Goodman and others.

Bridgeton, N. J.—J. Paul Bateman Co., to manufacture motor car bodies; capital stock, $100,000.

Bloomington, Ind.—College Avenue Motor & Sales Co., to deal in motor cars and accessories; capital stock, $30,000; incorporators, N. H. Hill, William Graham, A. V. Buskirk, Charles Small, J. K. Barclay.

Cleveland, O.—The Carnegie Auto Body Co.; capital stock, of $10,000; to manufacture bodies; incorporators, Clark T. McConnell, John Andres, George T. McConnell, Frank K. Pickering, Charles A. Hyde.

Cleveland, O.—Coan Rotary Valve Engine Co.; capital stock, $25,000; incorporators, Albert Wyes and others.

Chicago, Ill.—The Chicago Tire Pump Co.; capital stock, $7,200; to manufacture and deal in tire pumps and motor car accessories; incorporators, George Mahler, A. E. Stensel and Anna Mahler.

Chicago, Ill.—The Schultz Tire and Supply Co.; capital stock, $5,000; to manufacture and deal in rubber and rubber goods; incorporators, Fred Goodhouse, D. Otton, and H. Udike.

Chicago, Ill.—Security Garage Service Co.; capital stock, $10,000; incorporators, J. C. McCormick, P. E. Lower, Frank H. Foster.

Chicopee Falls, Mass.—Federal Rubber Co., motor car tires and other rubber goods; capital stock, $2,000,000.

Cincinnati, O.—The Cincinnati Yellow Taxicab Co.; capital stock, $10,000; to operate a taxicab service; incorporators, George W. Ritter, Bernice Swisher, John B. McMahon, Myrtle Hotchkiss, and Ethel Halliday.

Columbus, O.—The Independent Tire Co.; capital stock, $10,000; to deal in tires; incorporators are Frank F. Cain, Merwyn R. Hatch, M. R. Hatch, A. B. Hatch and M. E. Cain.

Germantown, O.—Germantown Auto Co.; capital stock, $15,000; incorporator, George P. Bailey.

Germantown, O.—The Germantown Auto Co.; capital stock, $15,000; to operate a sales agency and garage; incorporators, George P. Bailey, Fred Nunnamaker, Anthony Fischer, John Flinspach and Harry A. Thompson.

Grand Rapids, Mich.—Rex Machine Co., to manufacture and sell machinery and motor car accessories; capital stock, $10,000.

Indianapolis, Ind.—Eureka Tire Filler Co., capital stock, $2,500; to fill rubber tires; incorporators, C. P. Baldwin, J. J. Greenen, Westley Stalcup.

Jersey City, N. J.—Mueller Motor Car Co., to deal in motor cars; capital stock, $25,000; incorporators, F. H. Mueller, August Mueller, Jr., and August Mueller.

Joplin, Mo.—Redell Motor Car Co., to deal in all kinds of motor cars and accessories; capital stock, $12,000; incorporators, A. T. Blackwell, E. Barrett and J. T. Hughes.

Newark, N. J.—Federal Truck Co., motor car supplies; capital stock, $10,000; incorporators, Joseph Wadsworth, Frederick T. Macrae, G. H. Ludium.

Newark, N. J.—U. S. Auto Co., general motor car business; capital stock, $30,000.

Niagara, Wis.—The Niagara Garage & Transfer Co.; capital stock, $2,000; incorporators, C. C. Stevens, Chester Brisbin and H. A. Stevens.

New York, N. Y.—Brookside Rubber Works, to manufacture all kinds of rubber articles, by products, etc., capital stock, $25,000; incorporators, J. McLaren, F. E. Knowlton and E. M. Beyal.

Oshkosh, Wis.—Sun-Ray Mfg. Co.; capital stock, $20,000; incorporators, A. W., A. F., and J. W. Dunham.

Paterson, N. J.—Wagahaw Garage, conduct garages, deal in motor cars, etc.; capital stock, $25,000.

Pittsburgh, Pa.—Arsenal Garage Co.; capital stock, $30,000; incorporators, J. J. Schill, Joseph Fuhrer, Jr., O. F. Harris.

Pittsburgh, Pa.—Burton Auto Fender Co.; capital stock, $100,000.

Richmond, Va.—Allen Auto Supply Co., maximum $15,000; incorporators, R. P. Allen, L. M. Von Schilling.

South Orange, N. J.—Olympic Park Automobile Racing Assn., to conduct automobile races; bicycle races, etc.; capital stock, $125,000

Wilmington, Del.—Palmer Tire and Rubber Co., deal in and with rubber gutta perch, etc; capital stock, $500,000; incorporators, Herbert E. Latter, Norman P. Coffin, Clement M. Egner.

Wilmington, Del.—Auto cooling & Heating Corporation, to manufacture chemicals for producing refrigeration and cooling of any kind; capital stock, $500,000.

From the Four Winds

SPECIAL FILM CAR—The Selig-Tribune, the animated news film released twice weekly through General Film Service, recently sent a specially-constructed motor car into Mexico. The plans for the war car were prepared by Editor Jack Wheeler, and the car was manufactured by the Thos. B. Jeffrey Co., Kenosha, Wis. This is probably the first occasion where a motor car has been specially built and equipped for war service by a news film service. The Selig-Tribune motor car, which is now in Mexico, carries 75 gallons of gasoline, 15 gallons of water, and 8 gallons of cylinder oil. An especially-construted top of khaki affords shelter during the day and can be adjusted as a sleeping and shelter tent at night. The car also is equipped to carry a camera, tripod, blankets, canned goods, cooking utensils, and there is a rack for machine gun equipment. In fact, the car has been so constructed that it can make a continuous journey of 800 miles without stopping for either gasoline, water or oil. There is also a bullet-proof body, and, in case of attack, the car can be operated from the interior of the box.

WISCONSIN Registrations Pass 1915—When the secretary of state of Wisconsin issued license No. 79,790 on May 9, the total number of licenses issued during the year 1915 was equaled. Since then more than 4,000 licenses have been issued, and by the end of May it is expected that the Wisconsin private owners' registry will have reached the 90,000 mark.

Organizations Would Buy Viaduct—The Kansas City Automobile Club and the Motor Car Dealers' Association, Kansas City, Mo., will do what they can to promote the plan for the purchase of the Inter-City viaduct by the two Kansas Cities, and the making of it a free viaduct. This structure was built more than 10 years ago, and has been used as a toll viaduct, though some of its facilities have never been improved.

K. C. Headlight Measure—The Automobile Club of Kansas City, Mo., has worked out a new ordinance concerning headlights which has been introduced in the city council, and now is in the hands of a committee. The chief feature of the ordinance is that it requires etched or ground glass on lamp doors, and permits the use of dirigible headlights in emergencies and when, as in case of rain or fog, ordinary headlights are inadequate; but the shaft from movable lights shall be directed well downward, and not into any person's eyes. In ordinary headlights, the lamp shall not exceed 36 candle power, and shall reveal objects 150 feet ahead; the direct shaft, door open, must keep under 42 inches, or the level of the lamp.

City Official Arrested for Speeding—The city of Milwaukee is believed to be the first municipality to become a customer of the Packard Motor Car Co. since the Twin-Six was brought out. The city has purchased a Packard Twin-Six for the use of the common council and committee work and inspections. On one of the first official trips, a party, consisting of the city clerk, one alderman and five newspapermen, was arrested by a deputy sheriff, who claimed the car was traveling in excess of 50 miles an hour on the concrete Janesville plank road.

Coming Motor Events

CONVENTIONS

June 12-16—S. A. E. annual cruise, Lake Huron and Georgia Bay.

TRACTOR DEMONSTRATIONS

July 17-21—Dallas Tex.
July 24-28—Hutchinson, Kan.
July 31-Aug. 4—St. Louis, Mo.
Aug. 7-11—Fremont, Neb.
Aug. 14-18—Cedar Rapids, Ia.
Aug. 21-25—Bloomington, Ill.
Aug. 28-Sept. 1—Indianapolis, Ind.
Sept. 4-8—Madison, Wis.

No Hunting from Motor Cars in N. Y.—Hunting in motor cars in New York state is barred according to a bill which has just been signed by Governor Whitman. The bill, introduced by Senator Voorhees, prohibits the taking of game from a motor car or with the aid of motor car headlights and prohibits taking game on highways in the State forest preserve counties.

Bees Swarm in Chauffeurs Seat—The hum of a motor car engine has become a familiar metaphor, but that it may be so realistic as to actually deceive a swarm of bees was shown when the ex-inhabitants of some Augusta citizens hive picked out a large motor car on a prominent street in which to make their home. The bees settled upon the cushions in perfect contentment, but this feeling did not extend to the chauffeur.

Revise Car Tax Schedule—County Clerk Byers, of Sangamon county, Ill., has been making a special study of motor cars and has established a code which will be of interest to every car owner and assessor of the west. He says that he has found that values placed upon the same class of cars by owners, differ so much that it became imperative that he revise every schedule which had to do with motor cars. In the future, he will make an assessment independent of the value placed upon the schedule by the owner, using a scale of standard value, the same as is done with real estate.